This electronic version (PDF) was scanned by the International Telecommunication Union (ITU) Library & Archives Service from an original paper document in the ITU Library & Archives collections.

La présente version électronique (PDF) a été numérisée par le Service de la bibliothèque et des archives de l'Union internationale des télécommunications (UIT) à partir d'un document papier original des collections de ce service.

Esta versión electrónica (PDF) ha sido escaneada por el Servicio de Biblioteca y Archivos de la Unión Internacional de Telecomunicaciones (UIT) a partir de un documento impreso original de las colecciones del Servicio de Biblioteca y Archivos de la UIT.

هذه النسخة الإلكترونية (PDF) للاتصالات الدولي الاتحاد في والمحفوظات المكتبة قسم أجراه الضوئي بالمسح تصوير نتاج (ITU) والمحفوظات المكتبة قسم في المتوفرة الوثائق ضمن أصلية ورقية وثيقة من نقلاً.

此电子版（PDF版本）由国际电信联盟（ITU）图书馆和档案室利用存于该处的纸质文件扫描提供。

Настоящий электронный вариант (PDF) был подготовлен в библиотечно-архивной службе Международного союза электросвязи путем сканирования исходного документа в бумажной форме из библиотечно-архивной службы МСЭ.

© International Telecommunication Union

telecommunication journal

OFFICIAL ORGAN OF THE INTERNATIONAL TELECOMMUNICATION UNION

Journal des télécommunications
Boletín de Telecomunicaciones

MAY 1963

Vol. 30 — No. 5

In this issue :

MAURICE PONTE

Scientific research and telecommunication

T. PERRY

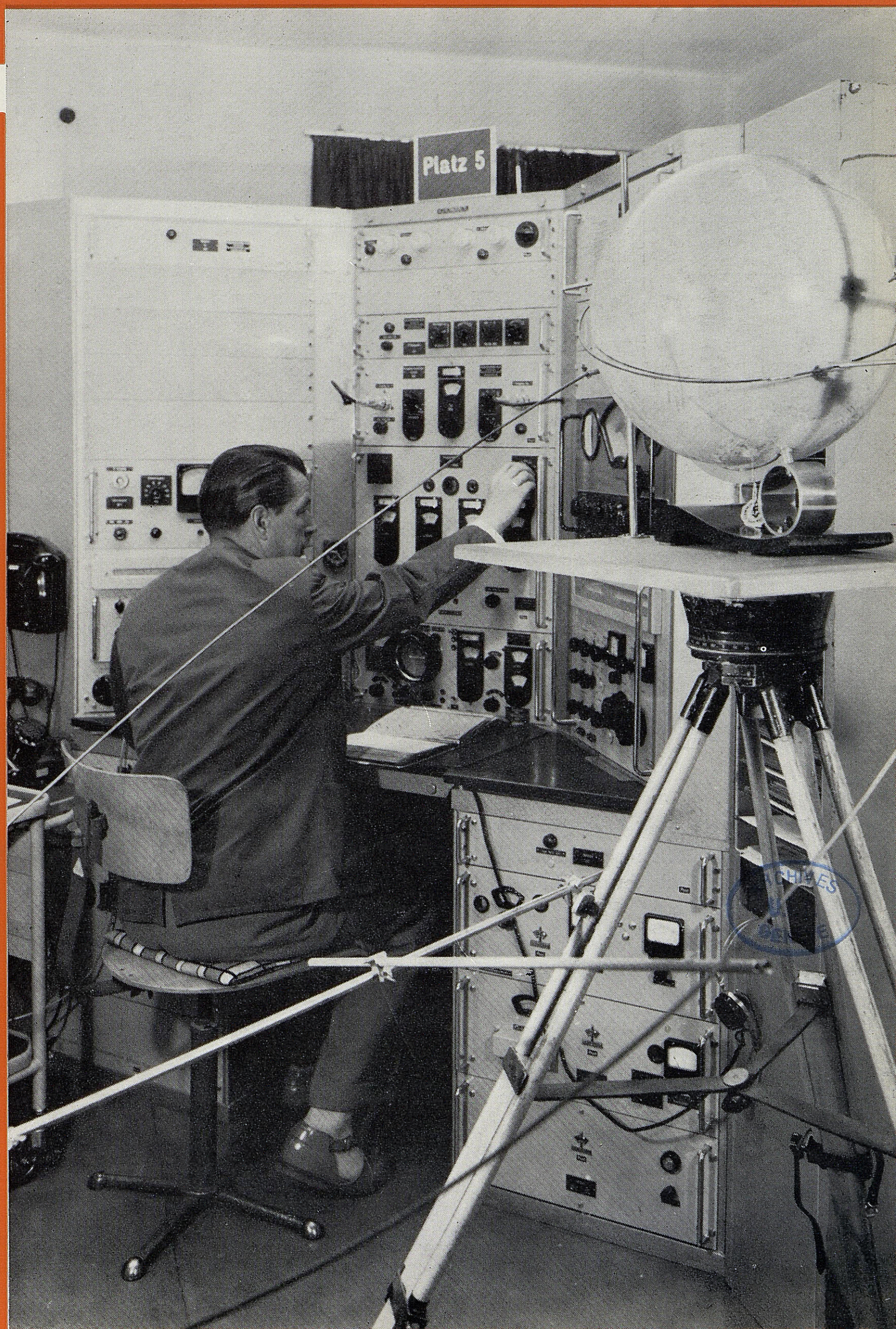
Telex and general telegraphy — competition and integration

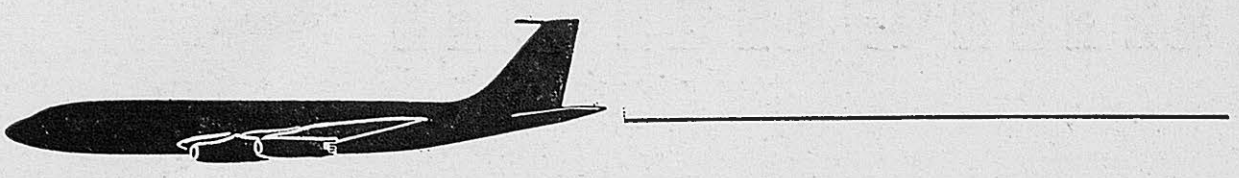
Telepersonnality

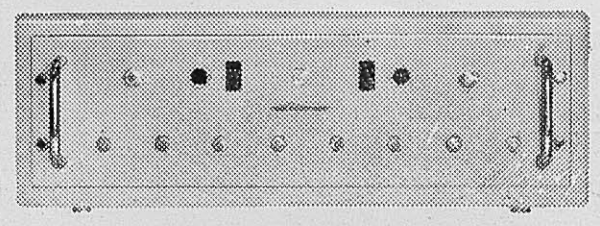
No. 29 — Vladimir K. Zworykin

A HIGH-ACCURACY FREQUENCY-MEASUREMENT DEVICE, USED FOR COMMUNICATION OF THE DOPPLER EFFECT WHEN AN EARTH SATELLITE PASSES OVERHEAD. IN THE FOREGROUND, A MODEL OF TWO SATELLITE TRACKS. →

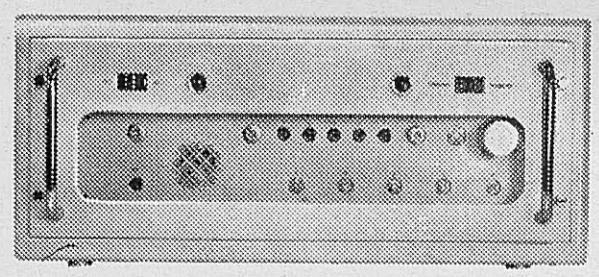
(Photo : Federal German Administration)







Crystal-controlled single-channel receiver, type 8RO 509



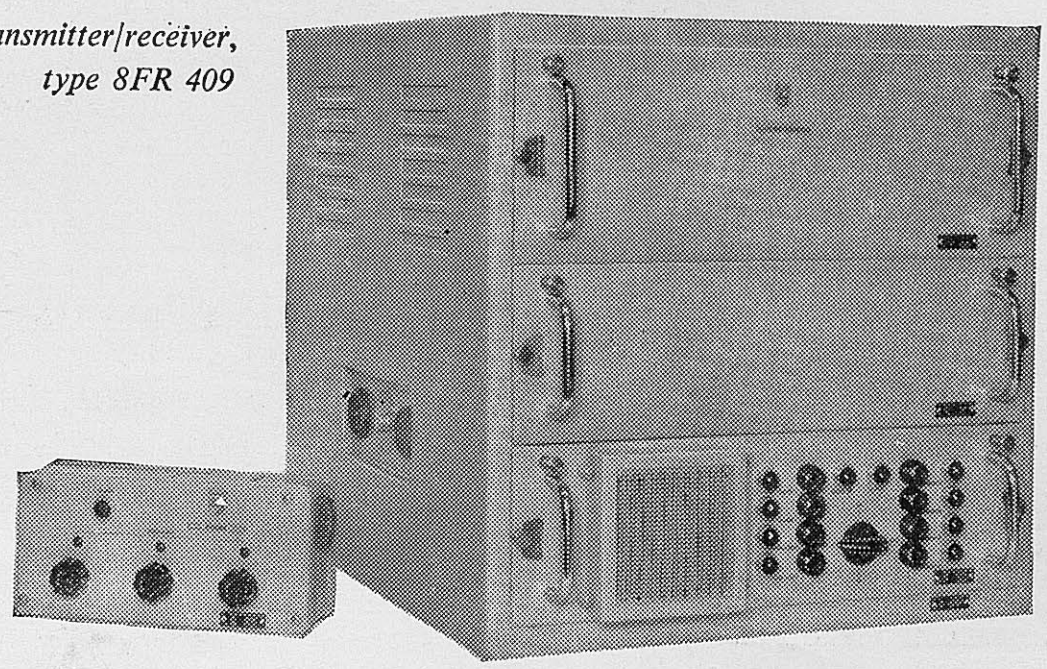
15 W crystal controlled single-channel transmitter, type 8RZ 509

UHF

Ultra High Frequency

PHILIPS

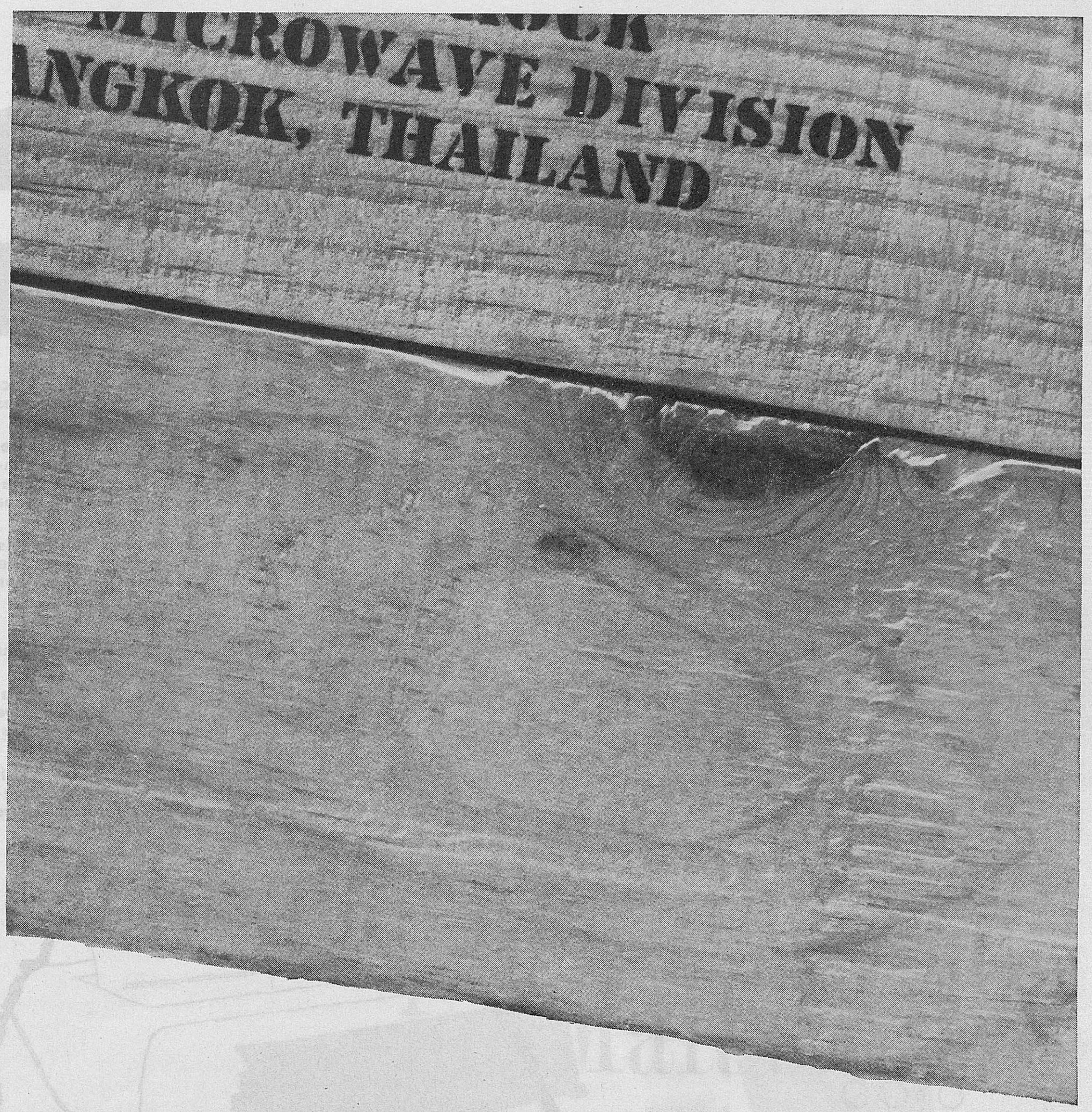
3500-channel transmitter/receiver, type 8FR 409



The steady expansion of civil and military air traffic necessitates equipment of higher standards for aeronautical communication systems. To meet this demand, Philips has developed an extensive range of equipment for UHF voice communication in ground-to-air, ship-to-air or ship-to-ship networks.

In this equipment high stability and utmost reliability are combined with great flexibility and ease of operation, as a result of modern thinking and long, world-wide experience in the field of telecommunication.

PHILIPS N.V. Philips' Telecommunicatie Industrie - Hilversum - the Netherlands



One of the biggest microwave packages ever delivered!

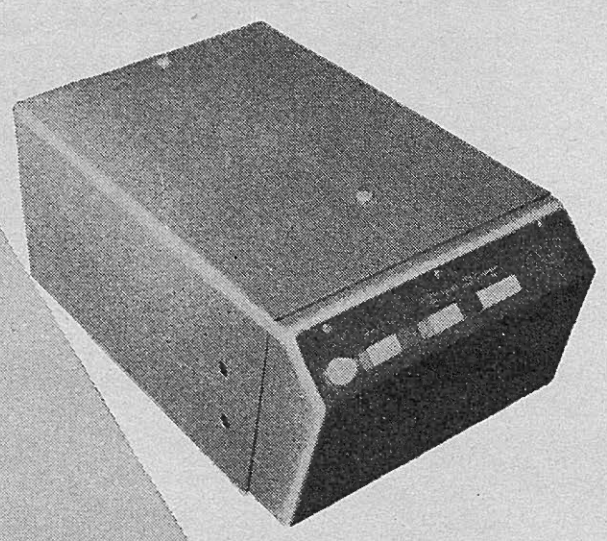
In one package, the Kingdom of Thailand is receiving a modern, 2,200-mile, integrated telephone, telegraph and program network. Collins is furnishing and installing all the equipment . . . in addition, we're providing access roads, bridges, towers, housing for the equipment, and constructing miles of cable and poles. In short, Collins is providing everything to give Thailand a complete microwave and carrier communication package, which meets CCIR and CCITT recommendations. Collins new transistorized, 5 watt I-F heterodyne, 100 milliwatt remodulating microwave, plus radio and cable carrier make up the system which is expandable to 960 channels. All circuits are directly transferred in groups between the microwave and cable systems without costly circuit-by-circuit patching. Its size alone demanded a company with capabilities in all phases of microwave and carrier application. Collins has these capabilities, and any one or all are available to you any time, on any size job, anywhere in the world. Learn how Collins capabilities can profit you. Call or write today. ☐ COLLINS RADIO COMPANY ☐ International Division, Dallas, Texas, USA.

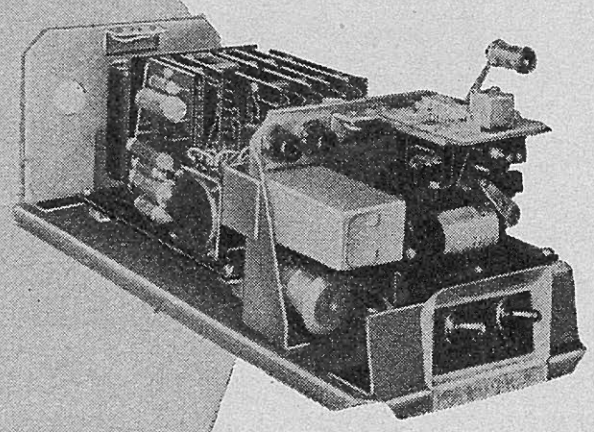
COLLINS

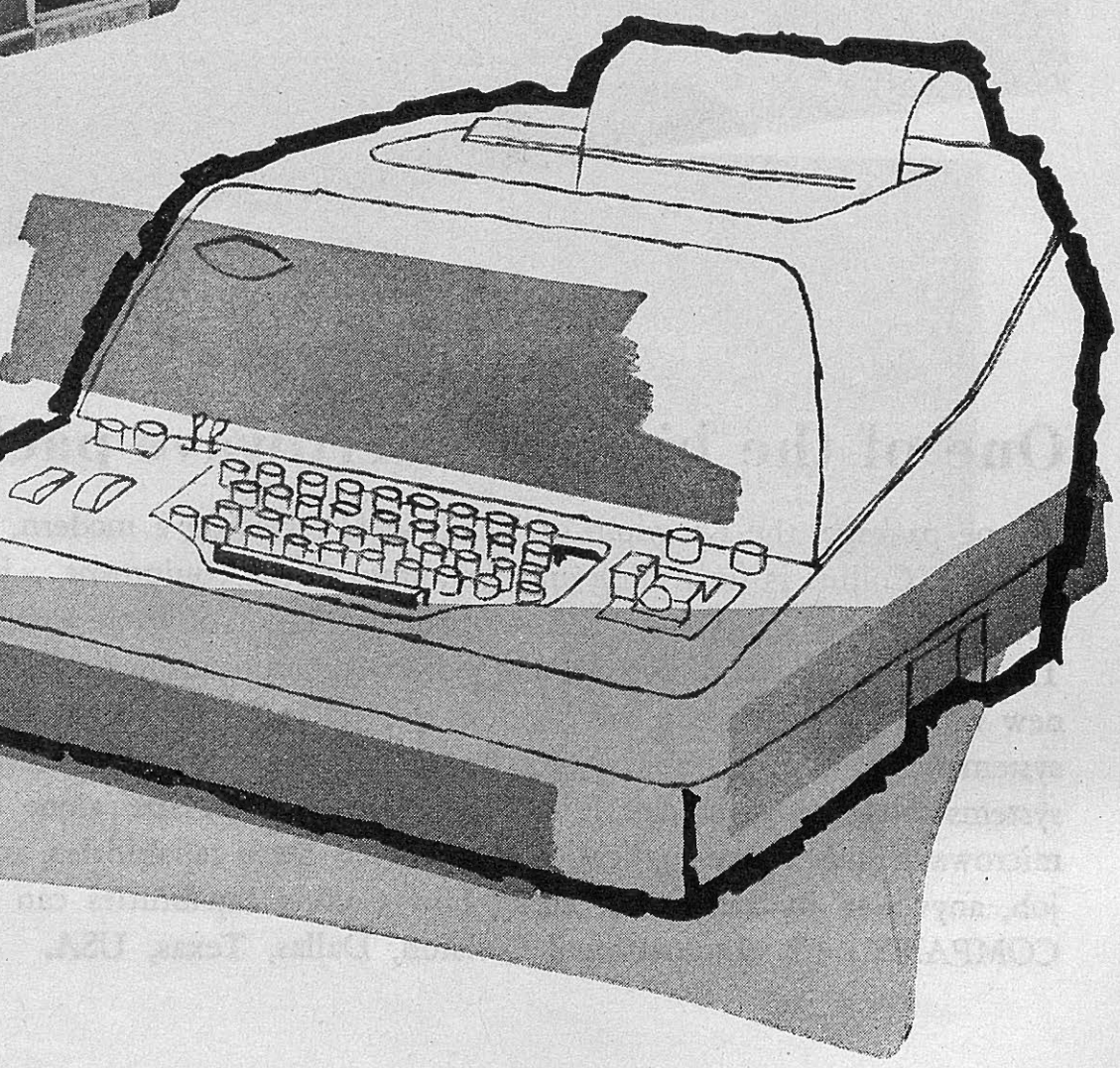
SAGEM

SPÉCIALISTE DES

terminaux télégraphiques







SAGEM propose une gamme d'accessoires pour satisfaire toutes les demandes :

- Téléimprimeur à page et à bande, émetteur-récepteur, perforateur imprimant, clavier perforateur à page, coffrets spéciaux, dispositifs pour imprimés, etc...
- Appareils pour réseaux Duplex tels qu'armoires de transit, matériels de chiffrement, transmetteur numéroteur transistorisés, etc..

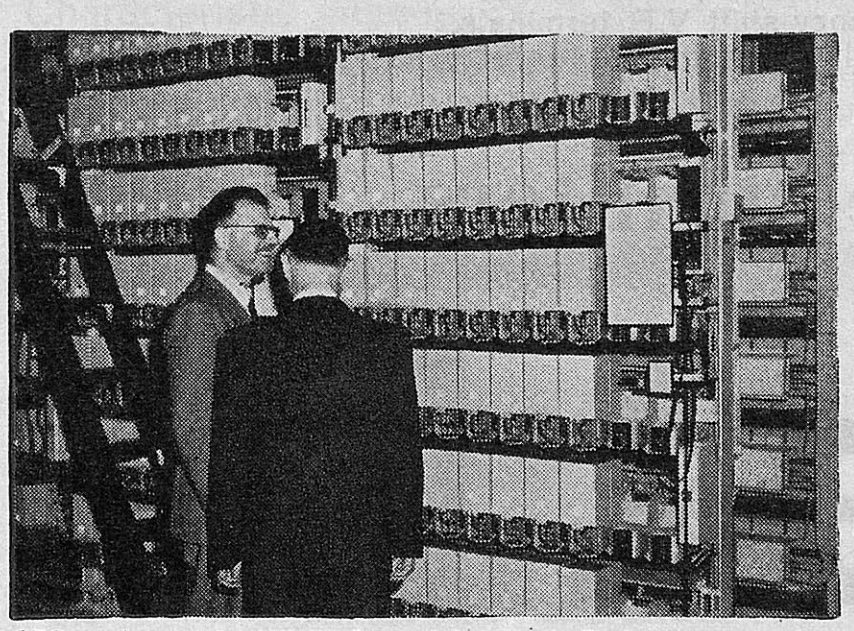
SAGEM offers a range of equipment to meet all requirements :

Page and tape printers, RCV-SEND sets, printing reperforators, keyboard page and tape perforators, special units, printer sets,

Duplex system units, such as transit center equipment, ciphering attachments or repeaters, solid state message numbering transmitters, etc...

6, AVENUE D'IÉNA - PARIS 16e - TÉL. KLÉBER 62-50 • TÉLÉSAGEM - PARIS • TELEX 20.815

telecommunications for Malta G.C.



STC equipment in Valletta Central Automatic Exchange

Latest STC Public Telephone Exchange to go into service in Malta is the 5 000-line automatic exchange at Sliema. The Central Telephone Exchange at Valletta, with a 7 000 lines capacity, was installed by STC in 1957. STC are supplying a further four exchanges situated at Birzebbugia, Rabat, St. Paul's Bay and Gozo (Victoria). All these exchanges are fully automatic and subscribers will be able to dial direct between all the areas.

An STC Microwave Radio Link, with a 240 circuit capacity, connects Malta with Gozo island.

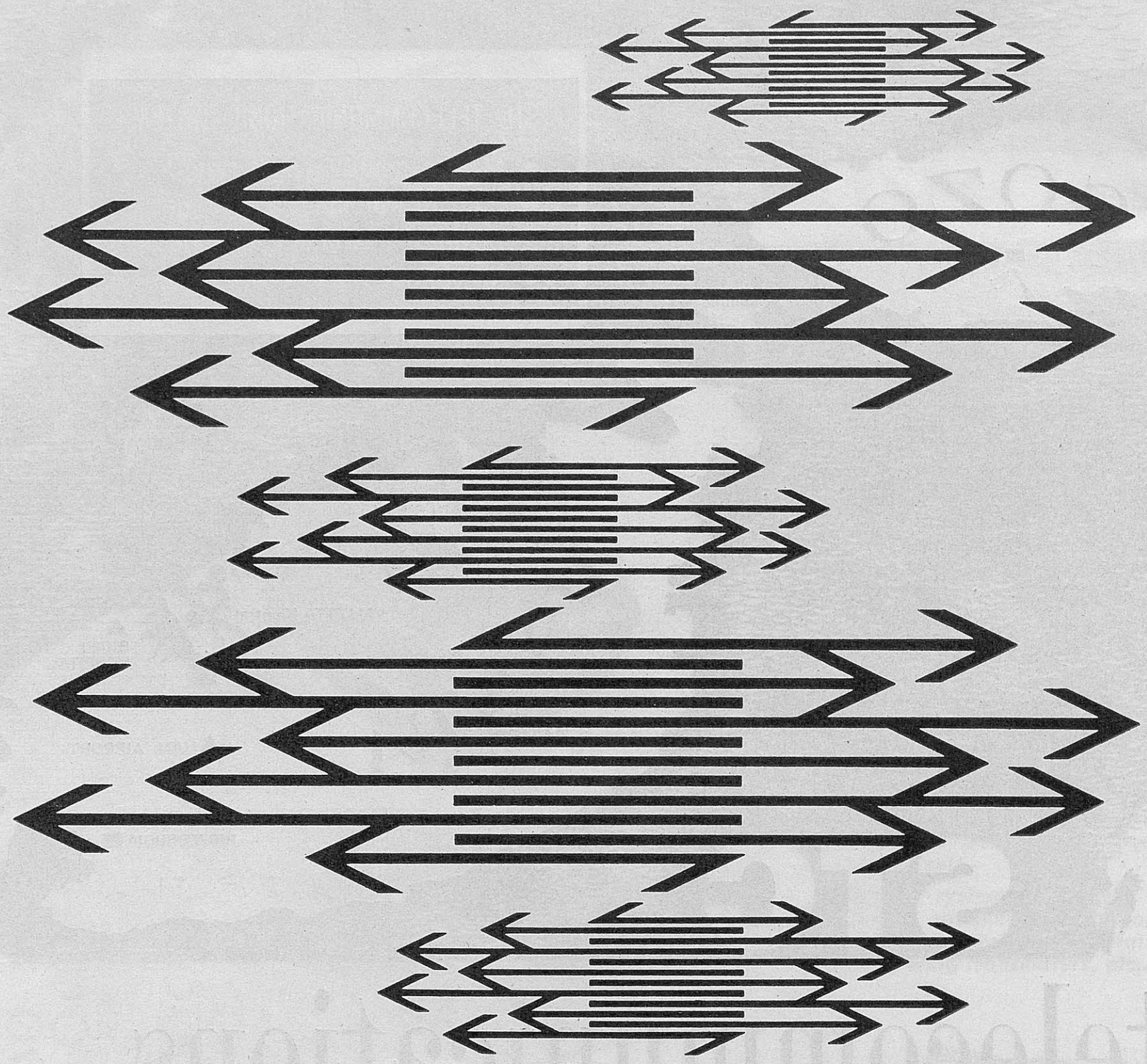
At Luqa Airport there is an STC 400 lines Private Automatic Exchange and, at Bighi Hospital, an STC 100 line Private Automatic Exchange.

ITT

63/ID

Standard Telephones and Cables Limited

TELEPHONE SWITCHING DIVISION: OAKLEIGH ROAD, NEW SOUTHGATE, LONDON N.11
Represented in Malta by: Bartolo Parnis Co., 2 Windmills Street, P.O. Box 252, Valletta.



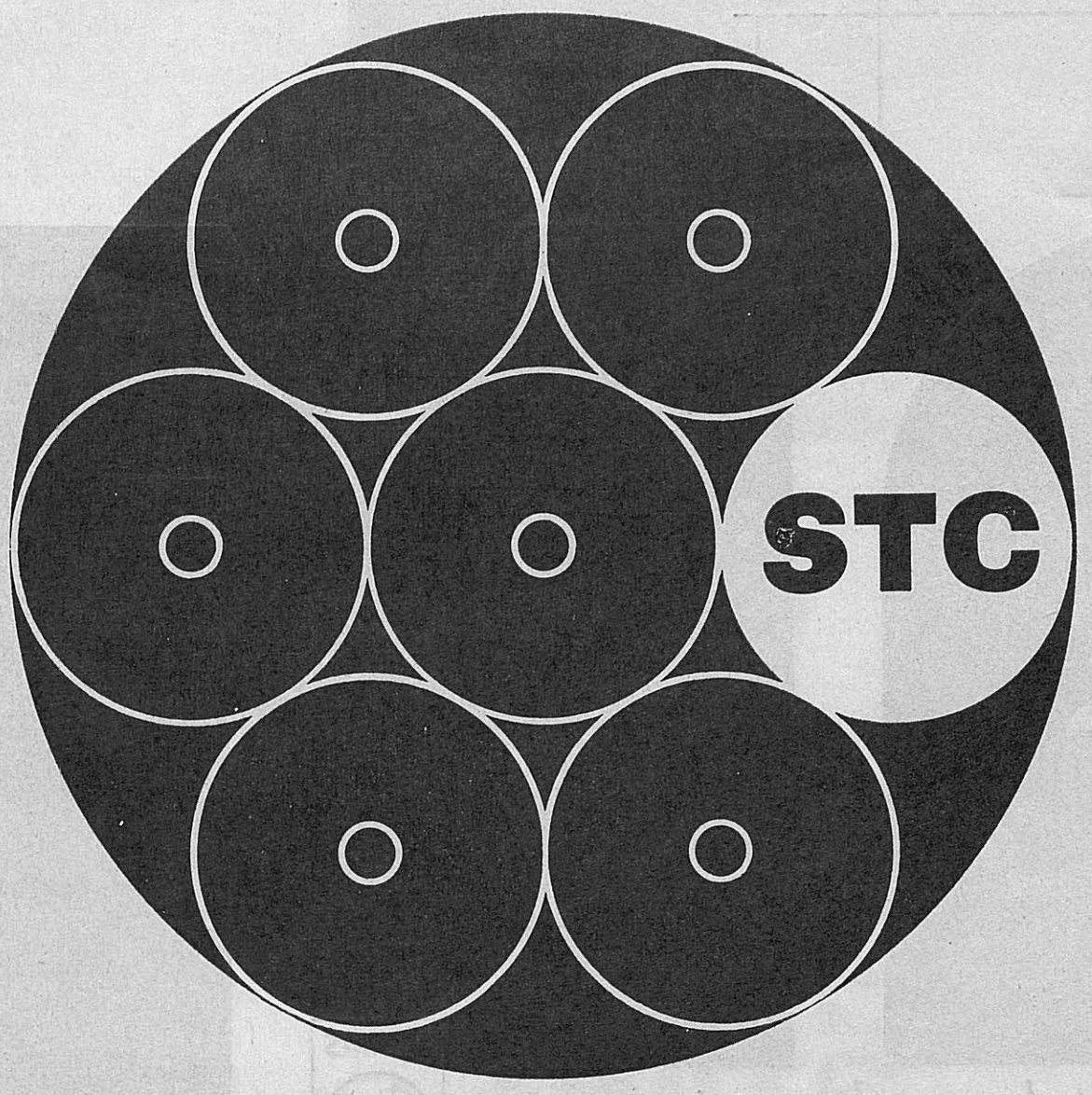
Teleprinters according to CCITT standards.
CCITT 5-unit No 2 alphabet-emission of 7.5 impulse code combinations and reception of 7, 7.42 and 7.5 impulse code combinations.

Send-receive and receive-only tape printing reperforators.
Keyboard perforators with and without local copy on page.
Tape reperforators.
Automatic tape transmitter attachment.
Single and ganged automatic tape transmitters.
Line units and control boxes.
Frequency-shift V.F. terminals.
Manual and automatic exchanges.

Teleprinters

olivetti

Ivrea (Italy)
San Lorenzo Factory
Telephone: 36.72
Cable Address: Teleolivetti Ivrea
Telex: 2 10 43

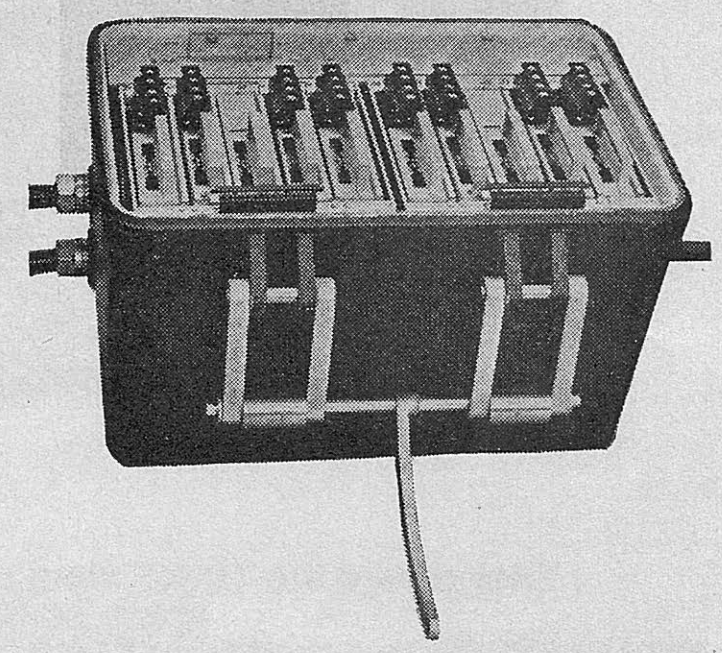


SMALL DIAMETER COAXIAL CABLE SYSTEMS

WITH LOW INSTALLATION AND RUNNING COSTS

STC system type LE1A, designed to comply with proposals currently before the C.C.I.T.T., carries up to 300 two-way speech channels at 4 kc/s spacing over one pair of coaxial tubes. The use of transistorized repeaters specially designed for manholes, footway boxes and underground containers means that the construction of repeater station buildings is reduced. Attenuation changes are regulated automatically by gain control units fitted to alternate amplifiers. Main repeaters facilitate the dropping and insertion of super groups.

Brief technical data: Coaxial core diameter 0·174 in. (4,4 mm); Characteristic impedance 75 ohms; Line frequency spectrum 60-1300 kc/s; Nominal repeater gain (at 1300 kc/s) 35 db; Corresponding spacing 5,8 km (3·6 miles).



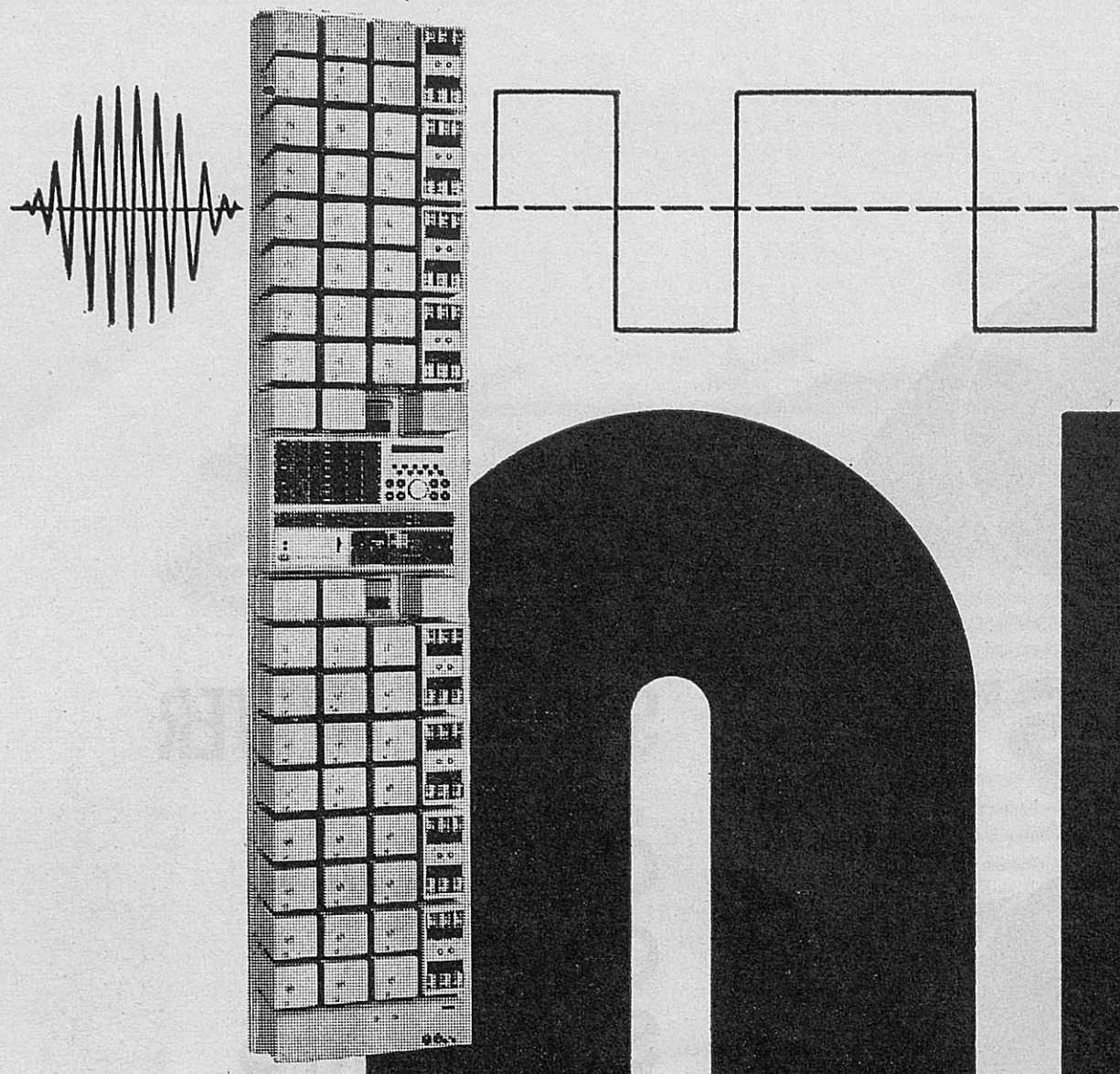
Dependent repeater housing with lid removed showing repeater units fitted for two systems.

Write, 'phone or Telex for leaflet C/AE38

Standard Telephones and Cables Limited

ITT

63/1C **TRANSMISSION SYSTEMS GROUP:** NORTH WOOLWICH · LONDON, E.16 · Telephone ALBert Dock 1401 · Telex 21645



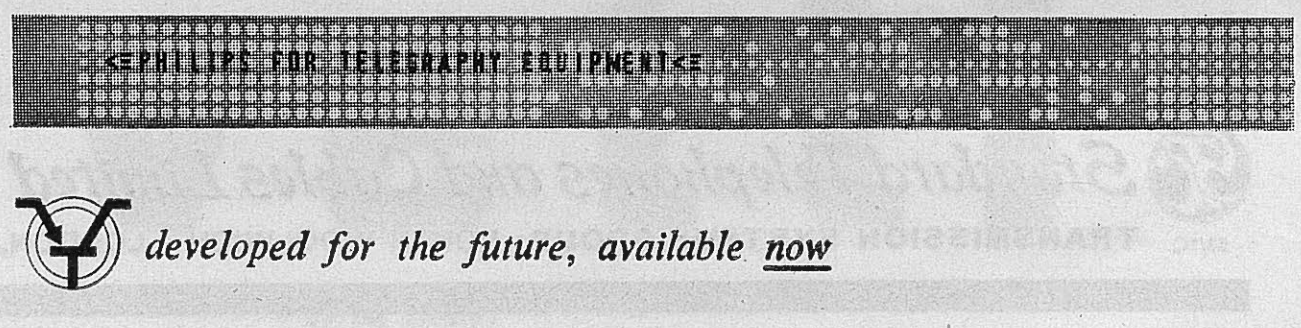
PCM

Amplitude modulated VF telegraph systems

48 channels on one 9-ft. bay side. With the type BTR 510 system PHILIPS have introduced transistor techniques to the field of telegraph transmission. Experience of more than 2 years has shown that, in addition to reduced space and low power consumption, minimum maintenance is an outstanding feature of this type of equipment.

N.V. Philips Telecommunicatie Industrie Hilversum, The Netherlands.

PHILIPS



developed for the future, available now

an advertisement from Philips KEY CAPITALS series.

FSK TELEGRAPH DRIVE UNIT
TYPE A.1422

TWO NEW TRANSISTORIZED DRIVE UNITS

INDEPENDENT SIDEBAND UNIT
TYPE A.1424

FSK TELEGRAPH DRIVE UNIT
TYPE A.1422

The A.1422 is a telegraph drive unit with facilities for remote control, fixed or pre-set shifts, twinplex or on-off keying and monitoring for distortion measurement.

Output 200mW into 72 ohms at 3·1 Mc/s.

Emissions A1, A2, F1, F6.
Provision is made for black and white facsimile.

Keying Speeds 50, 100, 200 and 300 bauds.

Meets C.C.I.R. Recommendations.
Weight 35 lb (15,9kg.)

INDEPENDENT SIDEBAND UNIT
TYPE A.1424

The A.1424 accepts one or two 250—6000 c/s inputs from 600-ohms lines and provides an output of 200 mW at 3·1 Mc/s for driving an ISB radio transmitter.
Remote control facilities and monitoring receiver incorporated.

Input —20dbm to +10dbm p.e.p. into 600 ohms at 250—6000 c/s.

Output 200 mW p.e.p. into 72 ohms at 3·094—3·106 Mc/s.

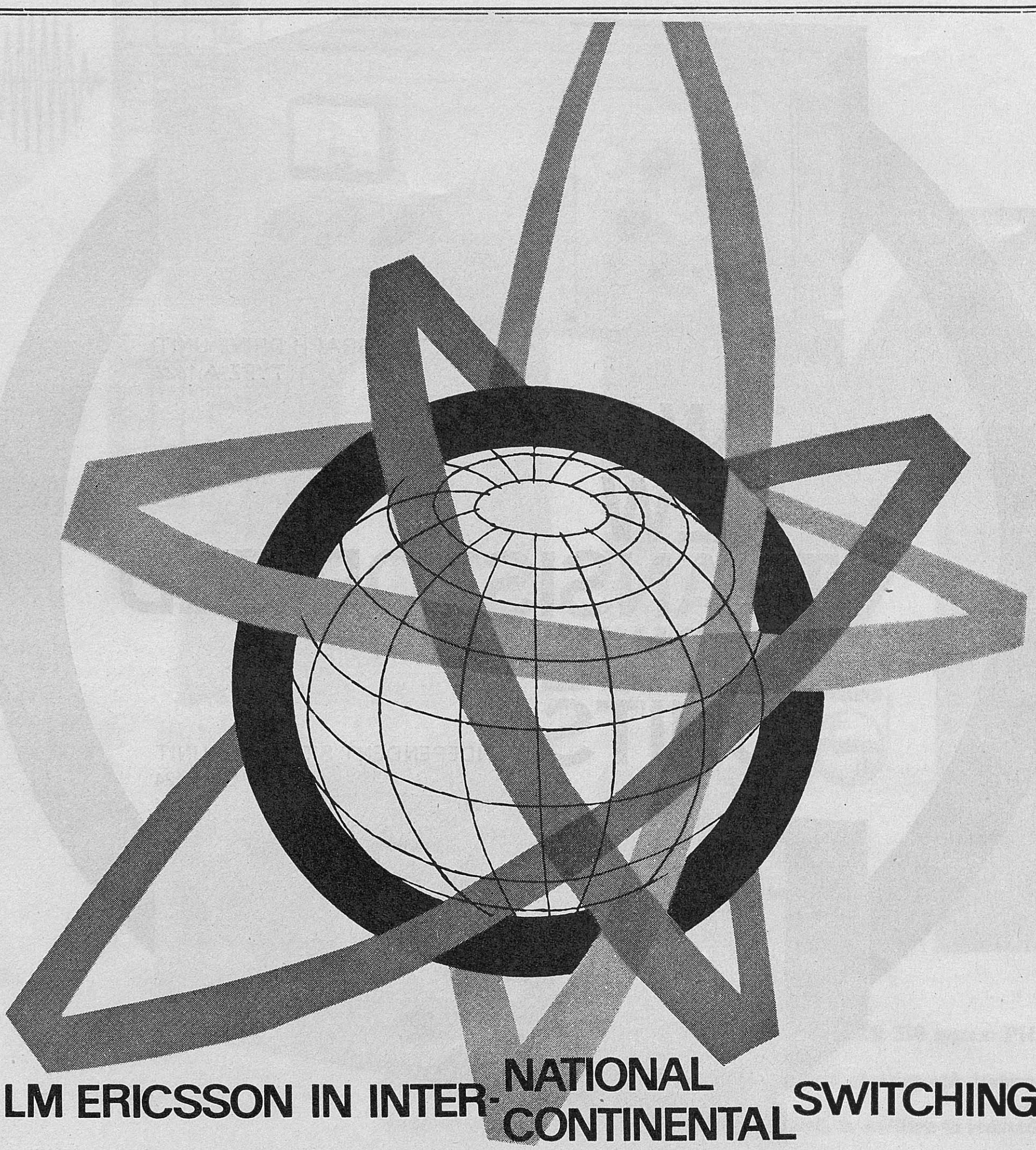
Emissions SSB, ISB or DSB.
Meets C.C.I.R. Recommendations.
Weight 30 lb (13,6kg.)

Write, 'phone or Telex for leaflets 304 & 305

Standard Telephones and Cables Limited

RADIO DIVISION
OAKLEIGH ROAD · NEW SOUTHGATE · LONDON, N.11
Telephone ENTerprise 1234 · Telex 21612

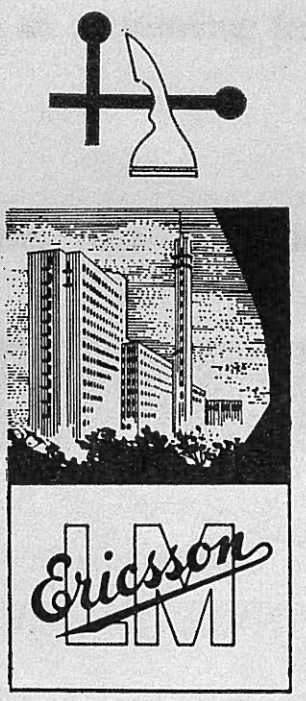
ITT



LM ERICSSON IN INTER-NATIONAL CONTINENTAL SWITCHING

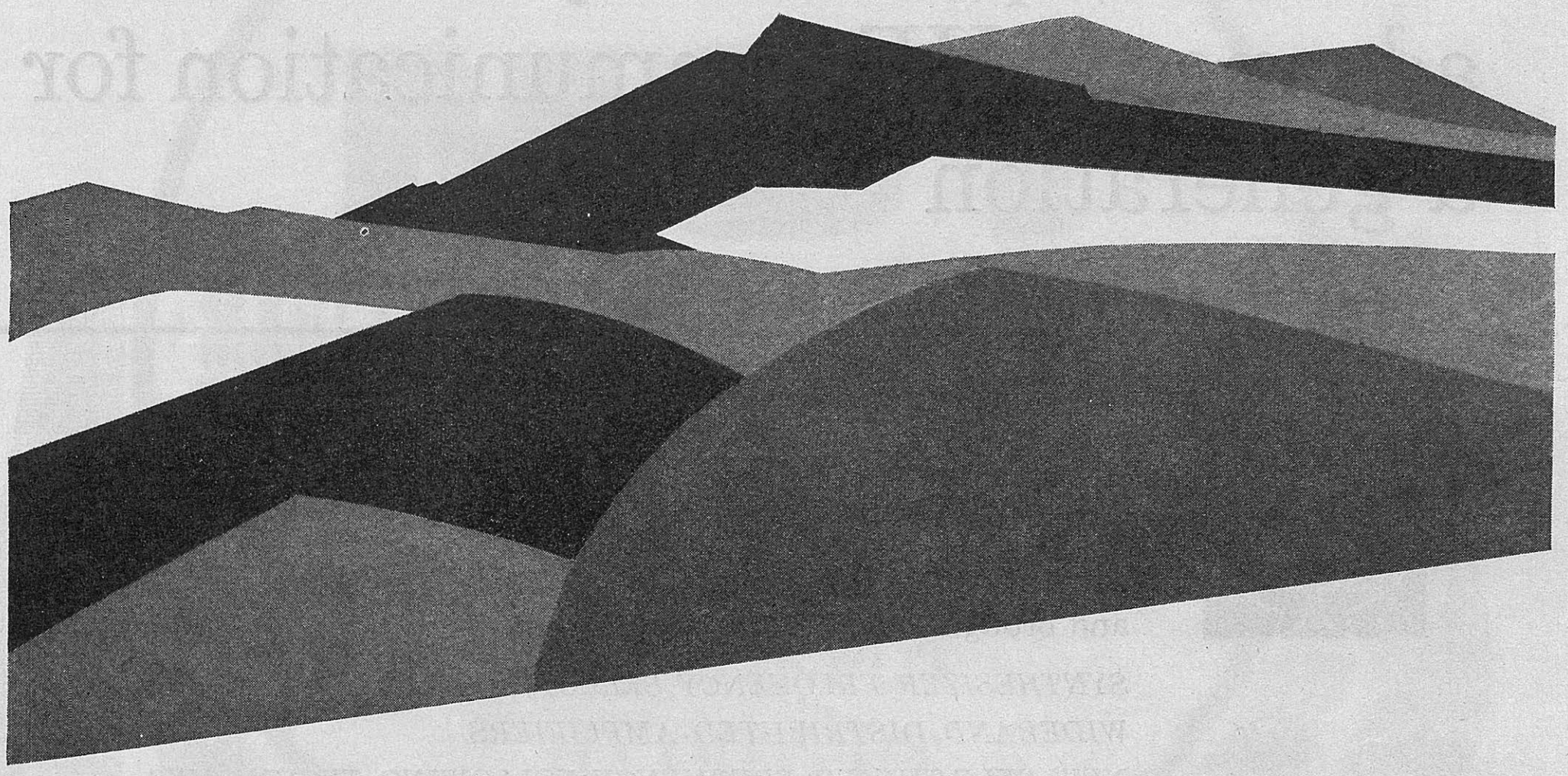
Plans for linking the continents by submarine cable circuits under the Atlantic and Pacific Oceans are gradually being realized. Laying of the first cables has already been carried out, thus providing a foundation for a future expansion of the international telephone and telex traffic between different parts of the world. Examples of this are the projects COMPAC and CANTAT included in the British Commonwealth round-the-world cable.

On the switching side of these projects, L M Ericsson has been awarded an order from Canadian Overseas Telecommunications Corporation for two telephone exchanges and two telex exchanges using L M Ericsson's famous Crossbar System. The exchanges will be installed in Montreal and Vancouver at the end of 1963 and will carry intercontinental telephone and telex traffic via submarine cables between Canada, Europe and Australia.



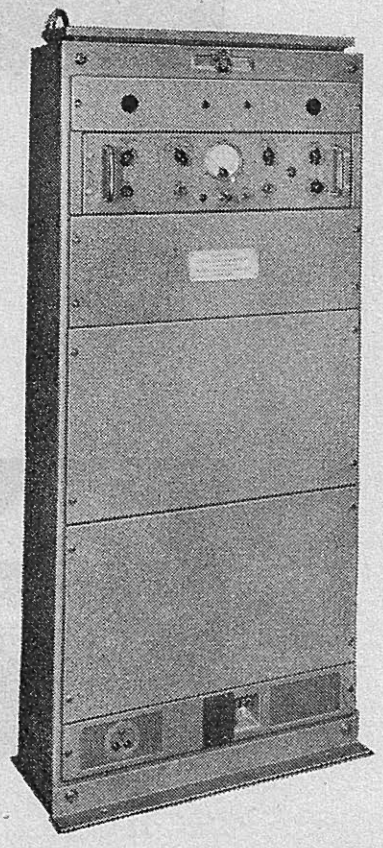
TELEFONAKTIEBOLAGET L M ERICSSON · STOCKHOLM 32 · SWEDEN

Improved 'Rural Radio' for versatile Cross-Country Communications



Type 800 UHF/VHF Radio Telephone Systems

The Type 800 single channel radio telephone system is an improved version of the well-known AT&E 'Rural Radio' and offers substantial economies both in installation and maintenance costs wherever the terrain prohibits the use of cables or overhead lines. The equipment is completely compatible with the existing range of AT&E telephone equipments, and signalling and relay sets are available which permit suitable termination of virtually any type of telephone, exchange or switchboard.
The equipment is contained in a single terminal rack and operates in the UHF and VHF bands with a maximum frequency of 500 Mc/s. The power output ranges from 6 watts to 150 watts according to requirements. The equipment is narrow band apparatus and high stability performance permits operation on adjacent channels spaced only 25 kc/s apart. Normally the use of aerial diplexers permits single aerial operation.
The Type 800 equipment is just one of a wide range of communication equipments built by AT&E, who also offer a comprehensive planning, surveying and installation service.
If you would like more details, please write to:



AT&E (Bridgnorth) Ltd · Bridgnorth · Shropshire · England

MARCONI MST

– the technological breakthrough that anticipates every foreseeable advance in HF communication for a generation

---

– MARCONI SELF TUNING HF SYSTEM

A decade of Marconi research and development has perfected and brought together into one completely integrated system—

SYNTHESIZER FREQUENCY SELECTION
WIDEBAND DISTRIBUTED AMPLIFIERS
NEW SELF-TUNING FREQUENCY FOLLOWING TECHNIQUES
AUTOMATIC AERIAL SELECTION
LOGARITHMIC AERIALS

– CUTS COSTS

Only one man is now required to control a complete station and the greater reliability of equipment has reduced the need for maintenance and maintenance personnel. Reliability is greatly increased by drastic design simplification which has reduced equipment size by 50%. New buildings can be smaller or existing buildings can carry more services with fewer ancillaries. Almost instantaneous frequency selection increases circuit efficiency and gives more time in service.

– is fully compatible with existing equipment encouraging progressive modernization of existing HF systems at low cost.

MARCONI COMPLETE COMMUNICATIONS SYSTEMS • SURVEYED • PLANNED • INSTALLED • MAINTAINED

MST

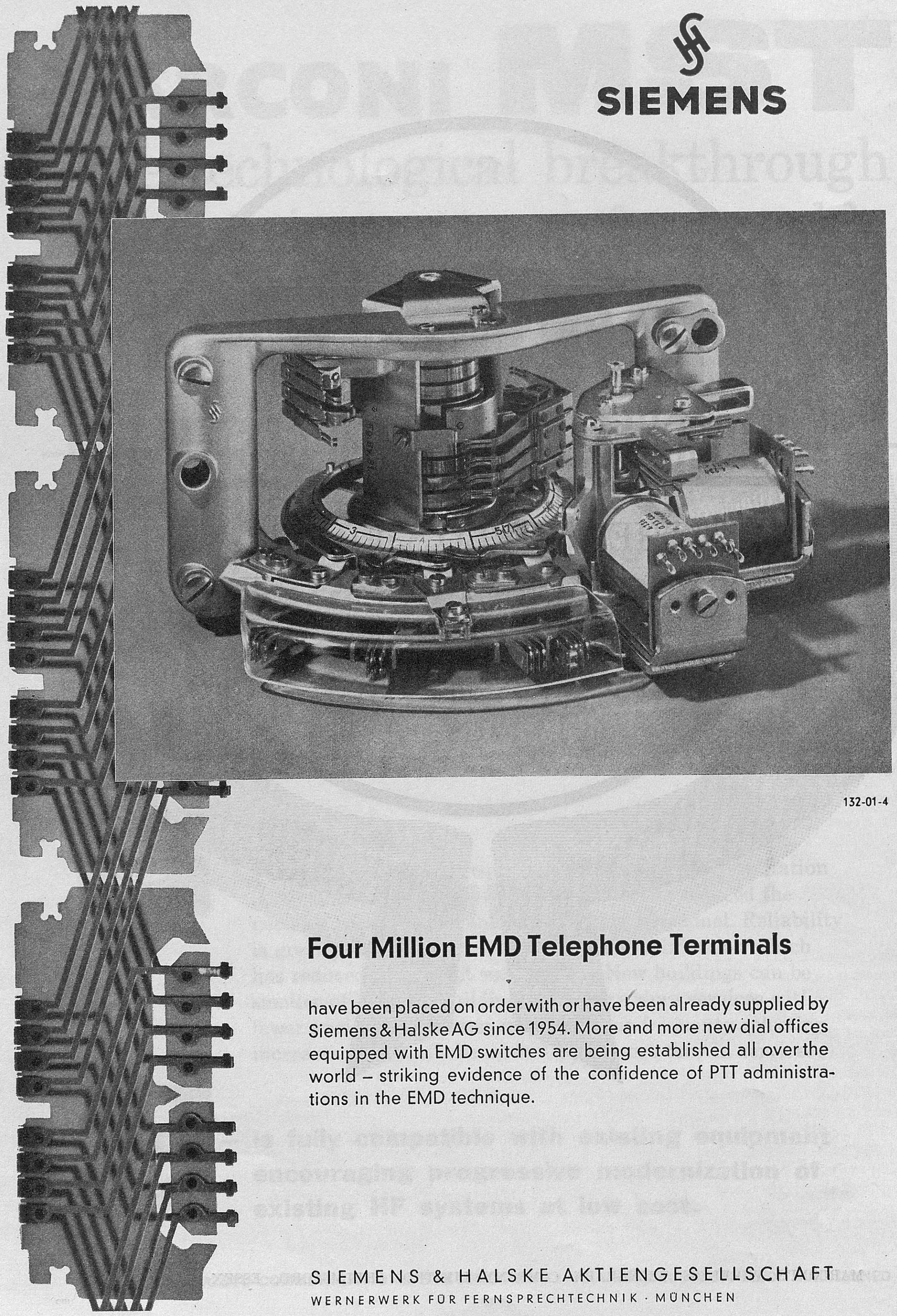
MARCONI SELF TUNING HF SYSTEM

THE WORLD'S FIRST
'STATION PLANNED' SYSTEM
FROM INPUT
TO OUTPUT

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED, CHELMSFORD, ESSEX, ENGLAND.

HI©

SIEMENS



132-01-4

Four Million EMD Telephone Terminals

have been placed on order with or have been already supplied by Siemens & Halske AG since 1954. More and more new dial offices equipped with EMD switches are being established all over the world – striking evidence of the confidence of PTT administrations in the EMD technique.

SIEMENS & HALSKE AKTIENGESELLSCHAFT

WERNERWERK FÜR FERNSPRECHTECHNIK · MÜNCHEN

telecommunication journal

Journal télégraphique (1869-1933)
57 volumes published

Telecommunication Journal (since 1934)
Volume 30

Published monthly by the International Telecommunication Union (ITU) in separate English, French and Spanish editions

VOLUME 30 • No. 5 • MAY 1963

CONTENTS

	Page
Editorial	129
News section	130
Scientific research and telecommunication *MAURICE PONTE*	139
The Journal fifty years ago	144
Telex and general telegraphy-competition and integration *T. PERRY*	145
Books	151
Smoothed monthly sunspot numbers	151
Telepersonality No. 29 Vladimir K. Zworykin	152
Review review	153
Official announcements	154
List of recent and forthcoming publications of the ITU	156

SUBSCRIPTION RATES: For all countries: Editions in three separate languages: English, French, Spanish. 20 Swiss francs yearly for one language edition, 30 francs yearly for two and 40 francs yearly for three separate language editions. Single copy: 2 francs. For all information please apply to the Editorial Office: Place des Nations, GENEVA (Switzerland), Telephone (022) 34 80 00 and 34 70 00. Telegraphic address: BURINTERNA. Postal-cheque account: Geneva I 50. Bank account: Société de Banque Suisse, Geneva.
Advertising: Annonces-Service Post S. A. Wydäckerring 140, Zurich 9/47. (Telegraphic address: ANNONCENSERVICE ZURICH.) Postal-cheque account: Zurich VIII 8071. Bank account: Union Bank of Switzerland, Zurich.

NOTICE — Opinions expressed in the articles appearing in the *Telecommunication Journal* are the authors' personal opinions and do not necessarily reflect those of the Union.

Material from this publication may be reproduced in full or in part, provided that the reprinted text is accompanied by the following acknowledgement: (ITU Journal).

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the ITU in preference to others of a similar nature that are not mentioned.

THE ITU IN AFRICA

The African VHF/UHF Broadcasting Conference which has just opened in Geneva for a month is the first of two Conferences on African Broadcasting which are to be held on the proposal of the Administrative Council —the second will take place in Madrid, at the invitation of the Spanish Administration, in 1964.

These Conferences mark a further advance in the ITU's comparatively recent engagement in Africa. For several years, of course, there have been ITU Technical Assistance projects on this vast continent, but it was only with the decision of the IInd CCITT Plenary Assembly in 1960 to set up a Plan Sub-Committee for Africa within the framework of the joint CCITT-CCIR Plan Committee that the Union became formally and actively concerned with African telecommunications as a whole.

The Sub-Committee has already shown remarkable dynamism and sense of purpose. Straight after its creation it set about the arduous task of collecting the information necessary for a draft plan for a pan-African telecommunication network. It did so to such effect that, at its first meeting in Dakar in January 1962 attended by qualified experts from 30 African countries, a Plan was in fact drawn up based on forecasts for the next five years. This is now known as the Dakar Plan.

More recently, the United Nations Economic Commission for Africa (ECA) has offered to co-operate with the Union in plans for African telecommunications. Responding to this valuable and timely initiative, the Administrative Council at its last session decided to transmit the Dakar Plan to ECA headquarters, where it will be formally presented at the Commission's sixth session next February by Mr. Gabriel Tedros of Ethiopia, who is at once Chairman of the Council, Chairman of the Plan Sub-Committee and—for good measure—Vice-Chairman of the African Broadcasting Conference. In addition, the Council decided to make two ITU experts, now on mission in Africa, available to ECA.

The ITU, then, is now on the move in Africa. This is a gain, not only for African telecommunications, but also for the Union itself.

C. M.

headquarters

THE COUNCIL MEETS

The 18th Session of the Administrative Council of the ITU held its first plenary meeting on Saturday, 23 March, at 3 p.m., at the Union headquarters in Geneva. In 1963 the Council has had to meet earlier than usual to prepare the Agenda for the Conference on Space Communications which will begin in Geneva on 7 October.

At the opening meeting, Mr. Juan A. Autelli, representative of the Argentine Republic and retiring Chairman, briefly reviewed the work of the previous session and recalled its historic importance in that it had been the first to consider space communication problems.

Mr. Gabriel Tedros elected Chairman

On a proposal by Mr. Autelli, Mr. Gabriel Tedros (Ethiopia), Vice-Chairman of the Seventeenth Session, was elected Chairman of the Eighteenth Session by acclamation. After thanking his colleagues for the honour they had conferred on Africa, his country, and himself, Mr. Tedros continued:

". . . more than thirty separate Telecommunication Administrations are being created in Africa.

" Certain of the countries concerned have realized the difficulties of building efficient telecommunication administration networks in each country with the result that some regional operating agencies have been set up. The present tendency is certainly towards the concept of common services.

" Nevertheless, gentlemen, the problems of organization, training and planning in Africa are formidable. Africa cannot develop unless its internal and external lines of communication are established."

He then affirmed that Africa would participate more and more in the activities of the Union. On the subject of space communications, he said:

" Turning from Africa, I must make special reference to the fascinating and all-important item on our agenda regarding the Conference on Space Communications. It is for you, gentlemen, to establish an agenda which will enable that conference to deal efficiently and expeditiously with the many fundamental problems which concern the future development of space communications.

" I should like to make a special point. The preparation of the agenda and the work of that conference are not, may I repeat, not *only the concern of the great countries to whom we owe the amazing development of space communications but also the concern of every Member of our Union. The future of telecommunications in every country of the world is bound to be affected by the introduction of space communications. The orderly development of space communications is absolutely essential and any means that this Council adopts to facilitate it will be to its credit and might save many years of wasted effort and frustration."*

Passing to the election of the Vice-Chairman, on a proposal by Mr. Lovell (United Kingdom), Mr. Mili (Tunisia) was elected Vice-Chairman of the Council by acclamation.

Statement by the Secretary-General

Mr. Gerald C. Gross, Secretary-General, then spoke. He drew attention to the outstanding events in the telecommunication world during the past year: the launching of the communication satellites Telstar and Relay, the flight around Venus and the first flight towards Mars by a Soviet space vehicle. Speaking of the development of telecommunications in Africa, where he had recently been on mission, he announced that the ITU would shortly be assembling a team of six top-level experts to draw up a plan for a pan-African telecommunication network. The project would be financed by the Economic Commission for Africa.

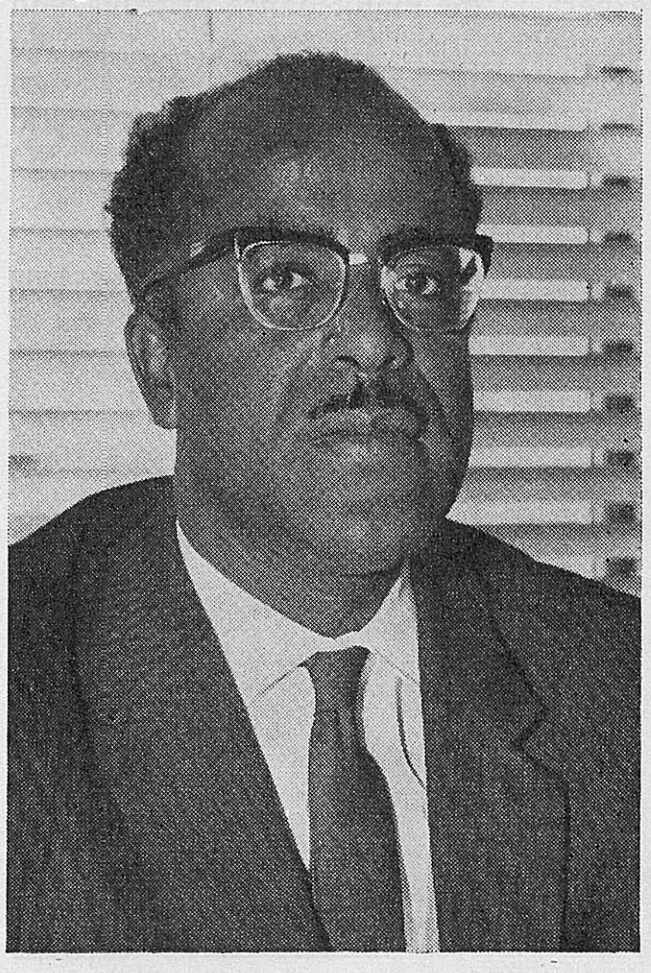
Summarizing the Union's activities during the past year, Mr. Gross recalled its participation in the *United Nations Conference on Science and Technology*

(UNCSAT). "UNCSAT", he said, "was an extremely valuable enterprise, at least so far as international telecommunications are concerned. It brought together some of the best minds in the scientific world, and a wealth of material was collected for telecommunications in the form of the eighty odd papers, some of which will be published in the *Telecommunication Journal* in agreement with the UNCSAT Secretariat. Thus UNCSAT will prove to have been a valuable stimulus for international telecommunications."

Mr. Gross went on to affirm that the most important item on the Agenda was a decision on an agenda for the Conference on Space Communications. He said:

"The only way to avoid a chaotic situation in space communications is to plan right now for a single global system available, in the words of the now famous General Assembly Resolution No. 1721, 'to the nations of the world on a global and non-discriminatory basis'. The Agenda for the ITU conference this fall must, in my view, reflect as far as possible the realities of this now extremely urgent situation. It is for that reason that I believe that the Agenda should include the proposals which have been communicated to me by the various Administrations."

The full list of those attending the 18th Session of the Administrative Council follows:



Mr. Gabriel Tedros

From left to right: the Secretary-General, the Chairman and Vice-Chairman of the Council, the Chairman and Vice-Chairman of the IFRB, the Director of the CCIR and his Adviser

Argentine Republic
Mr. Juan Antonio Autelli,
assisted by Mr. Osvaldo G. García Pineiro

Australia (Commonwealth of)
Mr. B. F. Jones,
assisted by Mr. C. J. Griffiths

Brazil
Mr. Eduardo Moreira Hosannah
Miss Annunciata Padula

Canada
(Until 31 March):
Mr. F. G. Nixon,
assisted by Mr. W. J. Wilson and Mr. W. E. Bauer
(As from 1 April):
Mr. W. J. Wilson,
assisted by Mr. W. E. Bauer

China
Mr. Gisson C. Chien,
assisted by Mr. P. N. Cheng and Mr. Y. T. Chang

Colombia
Dr. Ing. Joaquín Quijano Caballero

Czechoslovak Socialist Republic
Mr. Miloslav Laipert,
assisted by Mr. Stanislav Houdek

Ethiopia
Mr. Gabriel Tedros,
assisted by Mr. Betru Admassié

France
Mr. Gustave Terras,
assisted by Mr. Yves Place

Germany (Federal Republic of)
Mr. Helmut Bornemann,
assisted by Mr. Johannes Kupper

India
Mr. Nangapuram V. Gadadhar

Iran
Mr. Ghassem Shakibnia

Italy
Dr. Federico Nicotera,
assisted by Mr. Andrea Caruso

Japan
Mr. Yoshizumi Asano,
assisted by Mr. Megumu Sato,
Mr. Masaru Takanaka and Mr. Akira Abe

Mexico
Mr. Lázaro Barajas Gutiérrez

Morocco (Kingdom of)
Mr. Mohamed Ben Abdallah

Philippines
Mr. José L. Lachica,
assisted by Mr. Roberto San Andrés

Spain
Mr. José Garrido Moreno,
assisted by Mr. Luis Arroyo-Aznar,
Mr. Joaquín Martín Vázquez and
Mr. José Mª Pardo Horno

Swiss Confederation
Mr. Alfred Langenberger
Mr. Rudolf Rütschi

Tunisia
Mr. Mohamed Mili

United Arab Republic
Mr. Ibrahim Fouad

United Kingdom of Great Britain and Northern Ireland
Mr. Charles E. Lovell,
assisted by Mr. H. C. Greenwood

United States of America
Mr. Edward A. Bolster,
assisted by Mr. Carl W. Loeber,
Mr. James Simsarian and
Mr. James Thomas Devine

USSR
Mr. Ivan Klokov,
assisted by Mr. E. Motine

Yugoslavia (Federal People's Republic of)

Mr. Konstantin Horvat

United Nations Observer:
Mr. Norman Luker

UN Technical Assistance Board and Special Fund (for Europe) Observer:
Mr. R. Etchats

The IFRB French Seminar

In the last issue of the Journal (April, 1963) we carried a report on the opening of the IFRB Seminar programme, the series having opened with the English Seminar commencing on 25 February, 1963, at ITU headquarters.

The second in the series is now completed, the Seminar topic was no longer " Frequency management and the use of the radio frequency spectrum " but " *Cycle d'études sur la gestion et l'utilisation du spectre des fréquences radioélectriques.*" In other words, from 25 March to 5 April, at the ITU headquarters the participants from the following nineteen countries: Algeria, Bulgaria, Congo (Brazzaville), Congo (Léopoldville), Finland, Greece, Guinea, Iran, Italy, Ivory Coast, Luxembourg, Mauritania, Monaco, Morocco, Portuguese Oversea Provinces, Switzerland, Togo, Tunisia and Turkey were gathered together in the French Seminar.

The curriculum, of course, remains the same for the Seminars in English, French and Spanish, but the lecturers and presentation inevitably change. Thus each Seminar has its own special character, its own atmosphere, which comes directly from its participants. But there still remain the common denominators, the interchange of ideas, the pooling of experiences, and the sharing of information.

For the French Seminar the guest lecturers were Mr. J. Piponnier and Mr. Y. Place of the French Administration, and Mr. N. L. Verraneman of World Meteorological Organization (WMO). The IFRB is most grateful for the participation of these experts, whose reputations foreshadowed the high standard of the papers they delivered.

The French Seminar is now over, and the IFRB is happy to report another success.

technical co-operation

Libya

Mr. Stanley R. Hayman, of the United Kingdom General Post Office (GPO) has been entrusted by the Technical Co-operation Department of the ITU with a one-year mission in Tripoli, Libya, since April 1963. Mr. Hayman has been with the GPO since 1924, specializing since 1929 in telecommunication operation in Manchester, Reading, Lancester, Bristol and Nottingham. At Bristol he also applied new methods for training telephone and telegraph operators.

In Tripoli, Mr. Hayman will study the staff organization necessary for the creation of an operating department within the General Directorate of PTT and will advise the staff already active. He will analyze statistics prepared on the basis of telecommunication network data, will examine the charges applied in Libya and will make appropriate recommendations regarding the latter. Furthermore, Mr. Hayman will make proposals regarding the purchase of operating equipment and will study ways and means of using existing equipment more efficiently.

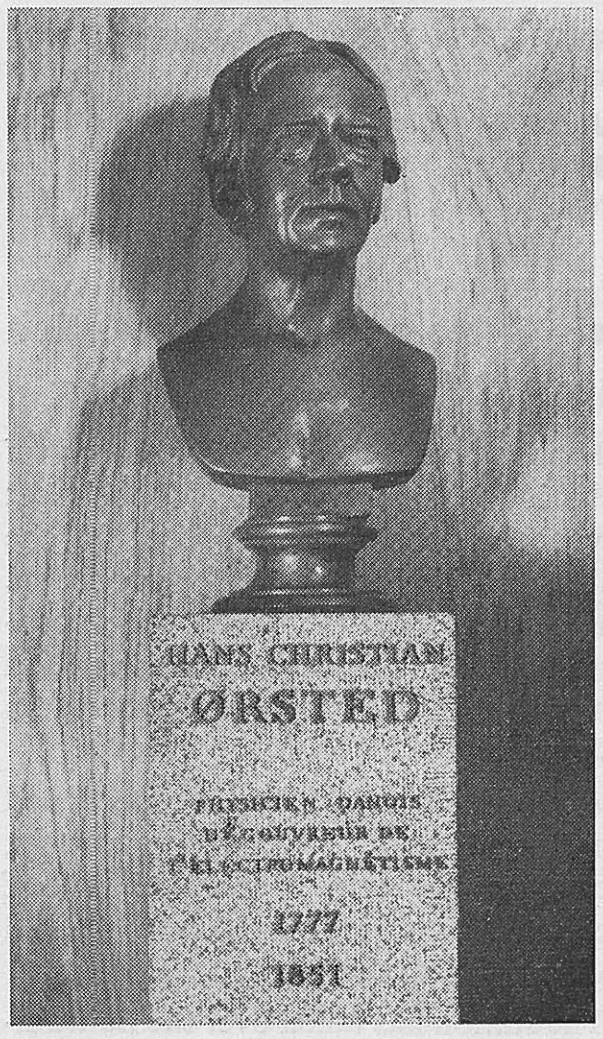
Mr. Hayman

Mission in the United Arab Republic (UAR)

Mr. Kenneth J. Green, telecommunication engineer and Deputy Director at the East African Post Office (EAPO), Nairobi, Kenya, has been appointed by the ITU to a six-month mission in the United Arab Republic (UAR) as an expert on the maintenance of trunk and open-wire lines. Mr. Green, who started his training as a telecommunication engineer at the United Kingdom General Post Office in 1934, had joined EAPO in 1948.

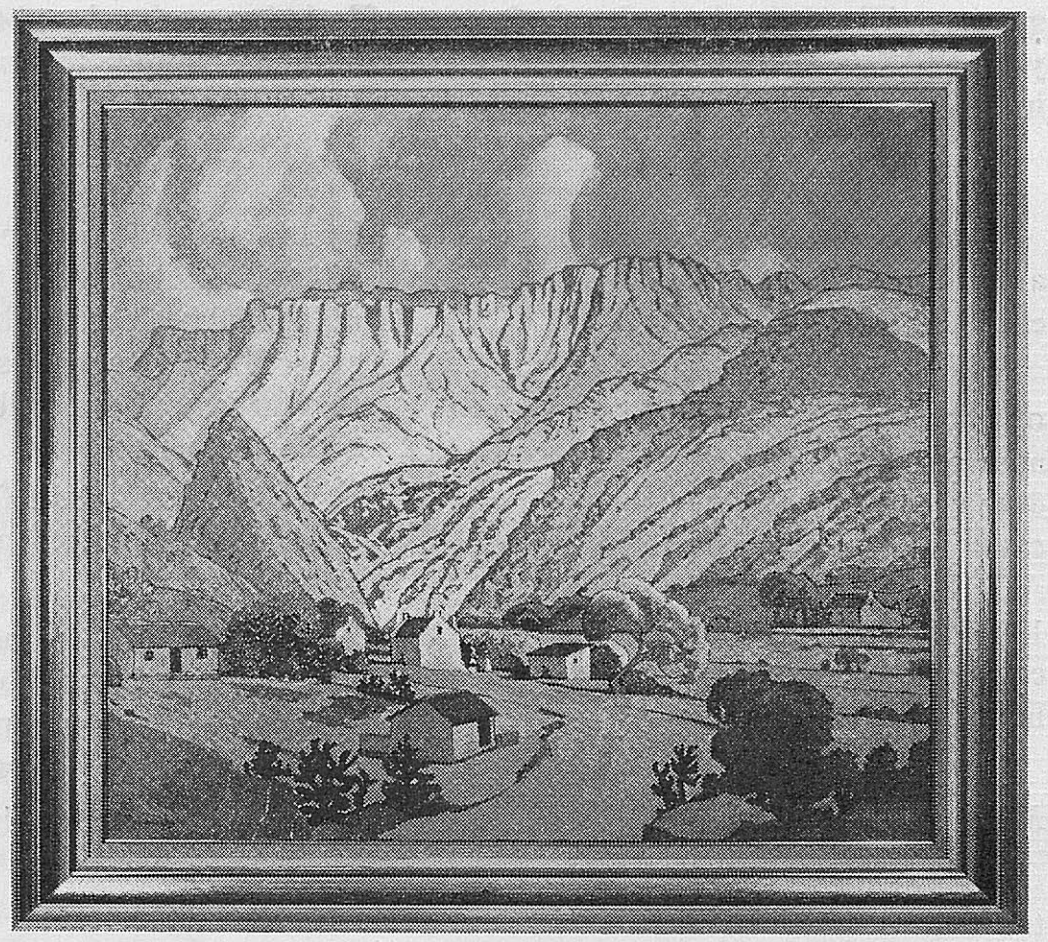
Mr. Green

GIFTS



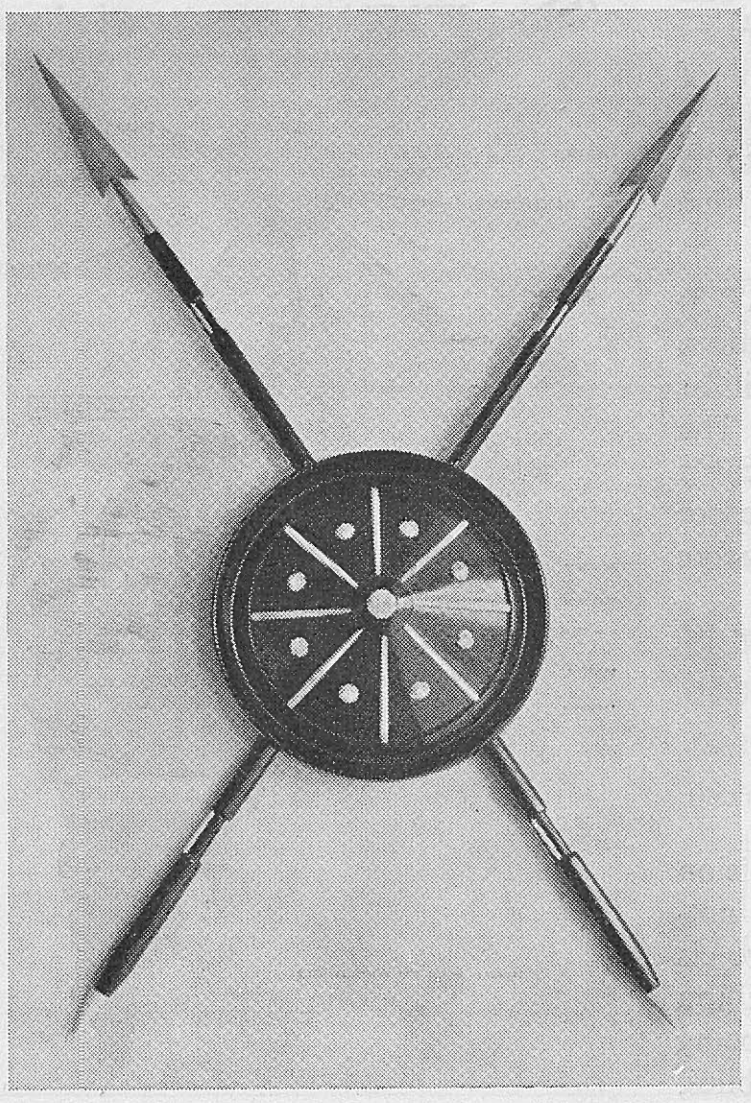
DENMARK

Bronze bust (65 cm high) of the Danish physicist Hans Christian Ørsted (1777-1851), who discovered electromagnetism. The bust is mounted on a grey-black plinth of polished granite (130 × 30 × 30 cm) from the Danish island of Bornholm.



REPUBLIC OF SOUTH AFRICA

A painting (110 × 90 cm) by the South African artist, Jacob Hendrik Pierneef depicting a South African rural scene: it portrays a farm in the arid Karroo region situated in the mountains near Meirings-poort.



ETHIOPIA

Traditional Ethiopian shield and spears presented by the graduates and students of the Telecommunication Institute, Addis Ababa, first technical assistance mission of the ITU.

administrations and operating companies

Telecommunication expansion in the United Kingdom

United Kingdom inland and overseas telephone and telex traffic continue to grow rapidly. Inland trunk telephone traffic is increasing by about 14 per cent a year and inland telex traffic by about 20 per cent. Similar increases are expected in 1963-64.

Local telephone calls are increasing by about 5 per cent a year, and this rate is expected to continue.

The number of telephone exchange operators fell by about 2000 in 1962-63 as a result of the conversion of manual exchanges to automatic working and the extension of subscriber trunk dialling. A further reduction is expected in 1963-64, but an increase of about 4000 in engineering and motor transport staff is likely.

Many more trunk circuits

To provide for the growth of trunk traffic the number of circuits will be substantially increased.

To meet the continuing demand for telephone service and the needs of the modernization and automatization programmes, contractors will start installing equipment in some 250 exchanges.

It is planned to add more than 300 000 lines to local networks, and it is expected that service will be brought to about 510 000 applicants. This should result in a net increase of 243 000. The total number of telephones (including extensions) will be about 9.5 millions by the end of the year.

The 10 000th line was added to the telex system in 1962-63, and a further growth of more than 15 per cent in the number of lines is expected in 1963-64.

Development plans

The programme for fully automatizing the telephone service by 1970 is proceeding at the rate of about two exchanges a week. The number of manual exchanges by March, 1964, is expected to be about 500; automatic service will then be available to 90 per cent of the total number of subscribers. By the same date about two-fifths of all subscribers will have subscriber trunk dialling.

A start is planned for 140 automatic telephone exchanges and repeater stations.

Installation in the new London radio tower of equipment to carry new trunk and television links is planned to start in the later part of this year.

Equipment will be installed in a new international exchange during 1963-64.

Following the tests with Telstar and Relay communication satellites, it is planned to continue the development of equipment and facilities at Goonhilly Downs ground station, with a view to its use as an operational station in due course.

A submarine telephone cable (TAT 3) directly connecting the United Kingdom with the United States of America will be brought into service in the autumn. The Commonwealth trans-Pacific cable (Compac) will also be completed before the end of the year. — *United Kingdom General Post Office.*

Television in the Union of Soviet Socialist Republics

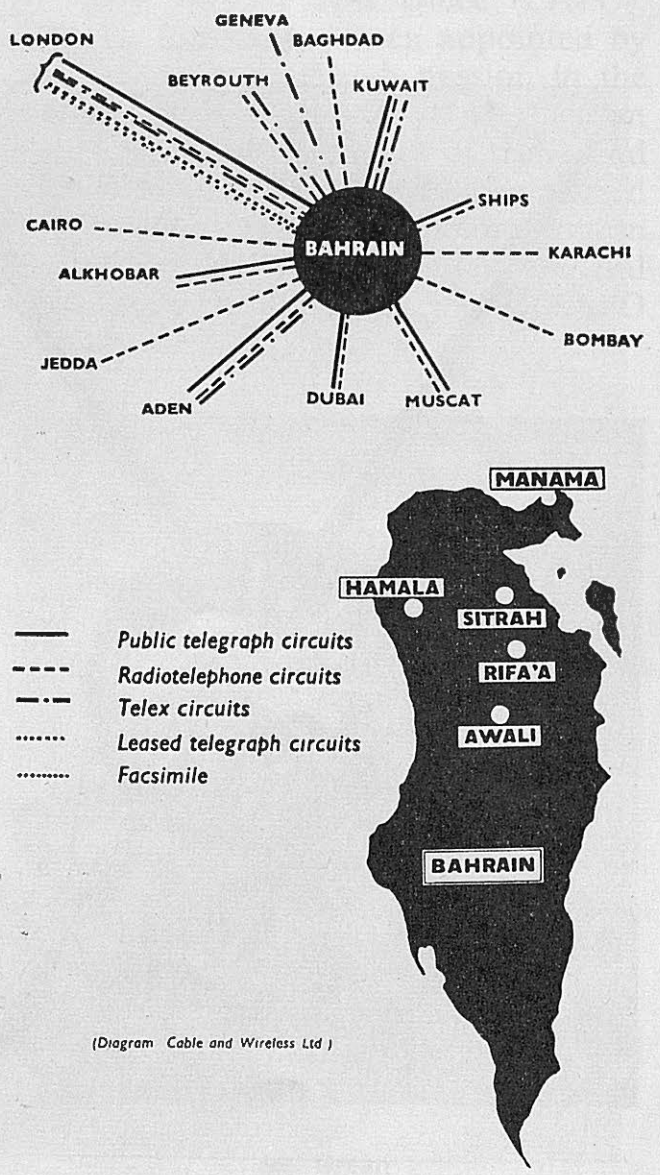
There are at present 123 television transmitters in the USSR, and the network comprises 250 relays. There is television coverage for some 90 million people. Fifty more transmitters are being built or are planned. In several republics, viewers in the capital can choose between two programmes. Since the beginning of this year, Muscovites have had three programmes to choose from. — *Radio-Revue*.

New Cable and Wireless station in Bahrain

Hamala, on the Persian Gulf island of Bahrain, is now the site of the most advanced transmitting station in the Cable and Wireless Limited organization. The new station is the biggest single project in the extensive modernization scheme which has been carried out in Bahrain.

A modern, completely air-conditioned building, houses twenty transmitters, mostly produced by Marconi. Many of these have been transferred from the old station at Hoorah (Manama Town).

The station has taken over the Bahrain-London radiotelephone/telegraph services formerly operated from Hoorah and provision has been made for the introduction of the Aden wireless telegraphy circuit, leased circuits to Kuwait and Aden, and radiotelephony to Cairo. Teleprinter leased circuits to London for the public and subscriber-to-subscriber will also be part of the service. By mid-1963 Cable and Wireless Limited hopes to have facilities for an international telex service in Bahrain.—*Marconi News.*



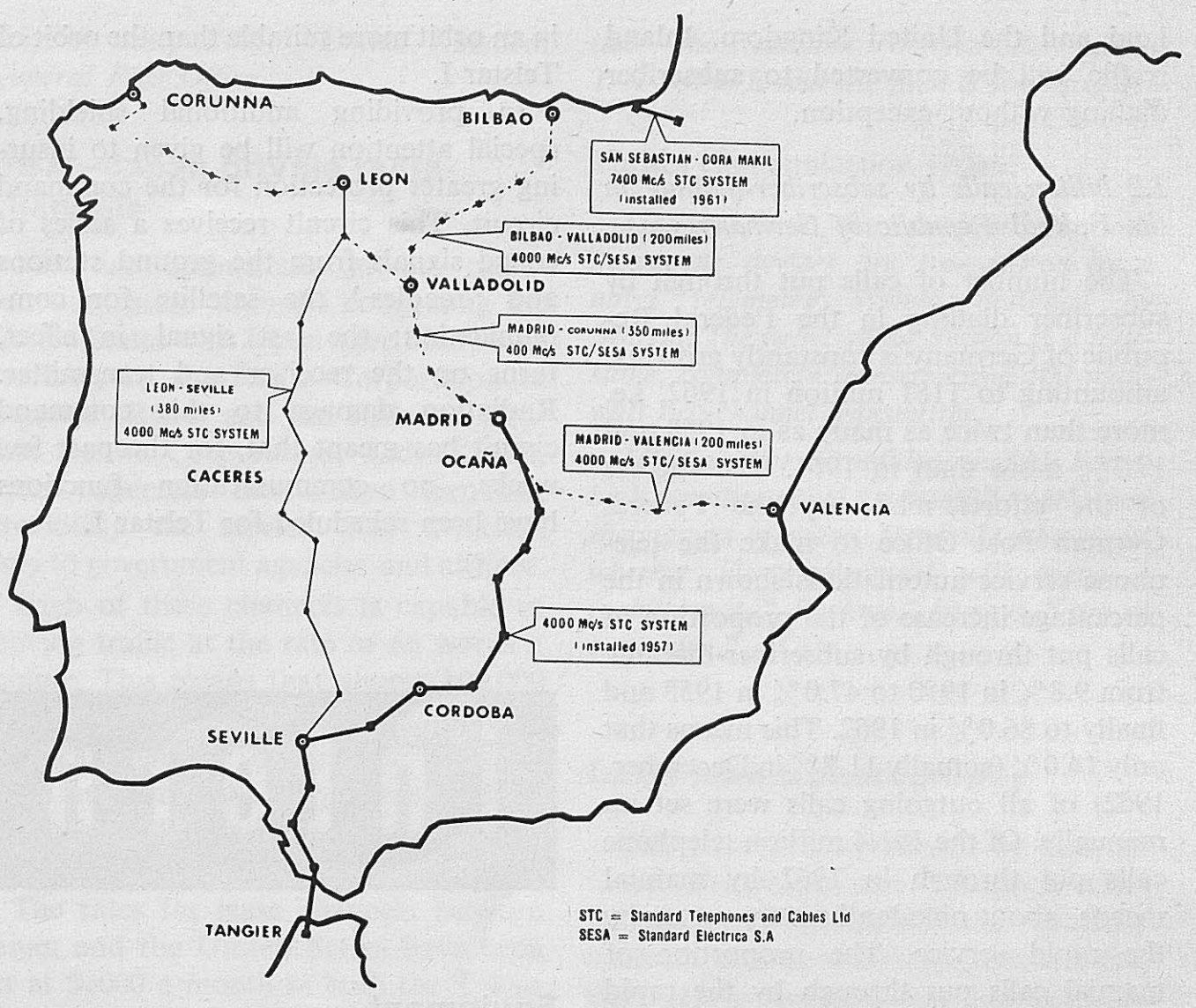
Microwave network for Spain

Microwave radio link equipment worth more than $4 900 000 has been ordered by the *Compañía Telefónica Nacional de España* from Standard Telephones and Cables Limited (STC) of London and its associated company in Spain.

This equipment will provide large numbers of long distance telephone circuits over a 1850 km network extending to Seville on the southern tip of Spain, to Bilbao in the north, Valencia on the eastern coast and Corunna in the north west.

Operating in the 4000 Mc/s frequency band, this equipment is capable of carrying 960 high quality telephone circuits on each radio channel. Standby equipment and extensive no-break power plant will ensure uninterrupted service.

A 400 km 600-circuit STC microwave system has been in service between Madrid, Seville and Tangier since 1957. The company has more recently installed a 240-circuit 7400 Mc/s short-haul link between San Sebastian and Gora Makil in north eastern Spain.—*STC.*



Three-quarters of international telephone calls now automatic in Federal Republic of Germany

Telephone traffic

On a sample day taken in November, 1962, 1.383 million telephone calls were made between the Federal Republic of Germany and other countries, of which 24.2% were put through manually, 48.9% semi-automatically and 26.9% by fully automatic means. This means that more than three-quarters (75.8%) of all outgoing international traffic was semi-automatic or fully automatic, while more than one third (35.5%) of this last figure applies to fully automatic calls. It should be noted, further, that fully automatic relations exist only with a few European countries for the time being.

The following table gives a breakdown of telephone traffic from the Federal Republic of Germany to other countries with which fully automatic relations exist:

	For every 100 calls			Share of full automatic traffic of the country concerned in the total of fully automatic traffic abroad
	% of manual	% of semi-automatic	% of fully automatic	
Austria	16.8	59.5	23.7	9.4
Belgium	5.3	54.7	40.0	13.5
Denmark	21.9	56.1	22.0	3.0
France	53.5	38.6	7.9	4.4
Luxembourg . . .	4.5	7.4	88.1	11.8
Netherlands . . .	8.1	50.1	41.8	36.0
Switzerland . . .	20.3	52.5	27.2	21.9
	—	—	—	100

For fully automatic calls, the subscriber dials his correspondent abroad direct, while for semi-automatic calls this is done by the international operator in the outgoing country.

Telex traffic

In 1962, there was a grand total of 25.1 million minutes of telex traffic between the Federal Republic of Germany and other countries, of which 21.5 million—i.e. almost five-sixths—were dialled by the subscribers themselves, while the remaining sixth were put through manually or semi-automatically. From a sample day to assess the composition of manual and semi-automatic telex traffic to other countries, it was noted that of 100 telex call bookings, 48 were put through immediately. A further 19 calls, which also fall within the rapid service, could not be set up immediately because the called station was engaged. In other words, the rapid service covers about two-thirds (67%) of all calls. Of the remaining 33 call bookings, 30 were put through by the delay service, while three were withdrawn.

Subscriber dialling exists at present for calls with Austria, Belgium, the Czechoslovak Socialist Republic, Denmark, Finland, France, the Hungarian People's Republic, Luxembourg, the Netherlands, Norway, Sweden, Switzer-

land and the United Kingdom. Inland traffic will be converted to subscriber dialling without exception.

1.2 billion calls by subscriber-dialling in the Federal Republic of Germany

The number of calls put through by subscriber dialling in the Federal Republic of Germany is constantly growing, amounting to 1181 million in 1962, i.e. more than twice as many as in 1958 and 17.7% more than in 1961. The success of the efforts made by the Federal German Post Office to make the telephone service automatic is shown in the percentage increase of the proportion of calls put through by subscriber-dialling, from 9.8% in 1950 to 47.0% in 1955 and finally to 86.0% in 1962. This means that only 14.0% (actually 11.7% in December, 1962) of all outgoing calls were set up manually. Of the 191.4 million telephone calls put through in 1962 by manual means, about nine-tenths were set up by the rapid service. The proportion of manual calls put through by the rapid service rose from 48.0% in 1950 to 88.4% in 1962.—*Presse-Mitteilungen des Bundesministeriums für das Post- und Fernmeldewesen.*

Pakistan television

The first stage of Pakistan's television network is to be set up in five main cities—Karachi, Dacca, Lahore, Rawalpindi and Chittagong—within the next two or three years.—*International TV Technical Review.*

Telstar II

A second Telstar will be launched in the near future according to the American Telephone and Telegraph Company (ATT). An important objective will be to learn how to extend satellite life by avoiding or overcoming radiation damage. It was radiation which disabled Telstar I's command circuit after four months of successful operation. Telstar II will be launched for ATT by the National Aeronautics and Space Administration (NASA), with the Telephone Company paying all costs for launching as it did for Telstar I.

Bell Telephone Laboratories, the research and development organization of the Bell System and creator of Telstar, has been studying various means of reducing radiation damage from the time its intensity became apparent. Among the possibilities are additional shielding for the satellite, and placing it in an orbit more suitable than the orbit of Telstar I.

In providing additional shielding, special attention will be given to insuring greater protection for the command circuit. This circuit receives a series of coded signals from the ground stations and 'readies' the satellite for communication; the last signal, in effect, turns on the receiver and transmitter. Radiation damage to this command circuit has meant that, for the past few weeks, no communication functions have been scheduled for Telstar I.

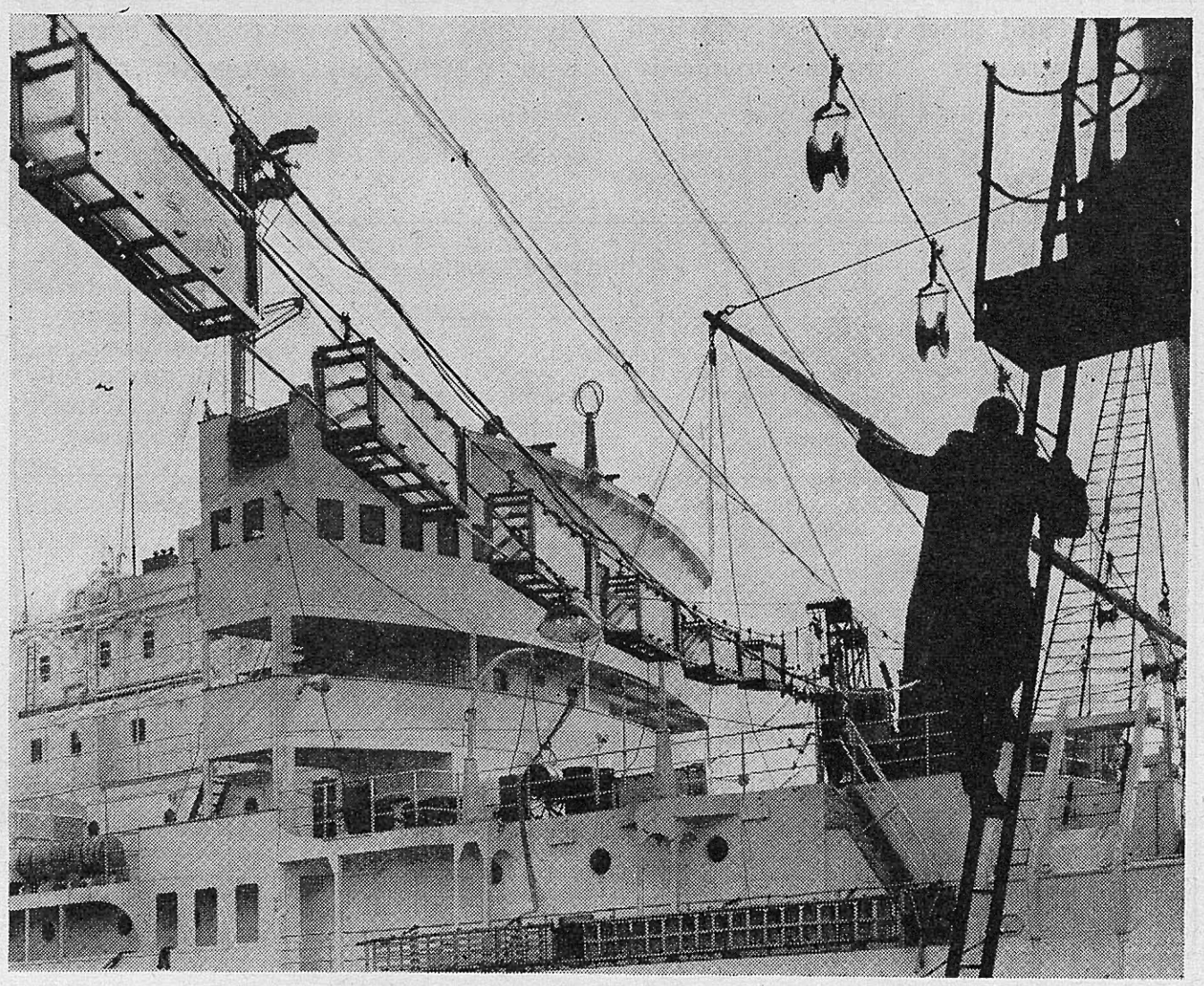
The availability of a modified Thor Delta rocket, more powerful than that used for Telstar I makes possible a higher and more suitable orbit. The altered orbit could be meaningful, Bell Laboratories believes, if Telstar II could be exposed to less of the high energy levels of the electron radiation in the inner van Allen belt. Also, a modification will be made in the radiation package to be used in Telstar II, and this should give additional information on radiation in space.—*British Communications and Electronics.*

international

Equipment for Vancouver-Hawaii telephone link

The picture shows deep-sea, lightweight cable being loaded directly from the Southampton factory of Standard Telephones and Cables Limited (STC) into HMTS Monarch for the first part of the Vancouver-Hawaii telephone cable. The laying of the final sections later in the year will complete the overall link between Australia, New Zealand, Fiji and Canada.

The cable, designed by the United Kingdom General Post Office, relies on a central steel core for its strength and has no external armouring since this has been found to be unnecessary for cables to be laid at great depths. Shore-end cable, by contrast, needs to be heavily armoured to protect it against wear due to shoal movement.—*STC.*



London-Paris subscriber trunk dialling (STD)

Today telephone subscribers in London can for the first time dial their own calls to subscribers in a foreign country.

On 8 March, the Lord Mayor of London, Sir Ralph Perring, inaugurated this new service when he dialled the first call to the French Minister of Posts, Telegraphs and Telephones, M. Jacques Marette, in Paris.

Speaking at the ceremony, the Assistant Postmaster General, Mr. Ray Mawby, M. P., explained that to make a call the subscriber has to dial 010 to get into the French telephone network, 331 to get Paris, and then the first three letters of the Paris exchange, followed by the number.

By the spring of next year all STD subscribers in London will be able to dial their own calls to all large cities and towns in France and to almost all exchanges in Belgium, the Netherlands, Switzerland and the Federal Republic of Germany. This will be extended to Denmark, Italy, Norway and Sweden probably in early 1965.— *United Kingdom General Post Office.*

USA—Japan private radio channels

The first commercial private radiocommunication channels connecting the United States with Japan have been made available by the Radio Corporation of America (RCA) and the Kokusai Denshin Denwa Corporation, Ltd. (KDD), which operates the Tokyo terminal. Previously the service was available only to government agencies and airlines.

Each of these channels is capable of moving traffic at the rate of 66 words a minute. This means that almost 100 000 words a day, or more than 600 000 words a week, can be transmitted in each direction, simultaneously. Leased channels are made available on a 24 hour-a-day, 7 day-a-week basis.

The rates for lease channels between Japan and the United States have been set at $4000 a month at both the Tokyo and San Francisco terminals.—*British Communications and Electronics.*

technical

Schoolboy builds satellite

The gold medal winner of the 1962 New York State Science Congress is a radio amateur, Martin Alter. The imaginative 17-year old high school senior from Lake Success, New York, won the medal for his entry of a home-built scientific satellite which he calls Thrises I.

Working evenings and week-ends, Martin designed and fabricated the satellite in his basement workshop over a two-year period. He financed the project from his radio and television repair service, sales of home-made electrical gadgets, mowing lawns and baby-sitting. Much of the harder-to-get components, such as transistors for the telemetry transmitter, sensor elements for the measuring circuits, and solar cells for the power supply, were furnished as gifts by several industrial firms encouraging space age science projects at the high school level.

Although not yet launched into orbit, the Thrises I satellite is no toy. It is a complex scientific package capable of measuring temperature, humidity, radiation, illumination and solar energy. It is from the first letter of each of these functions that the satellite derives its name, T-H-R-I-S-E and the final S for satellite.

Thrises communication system

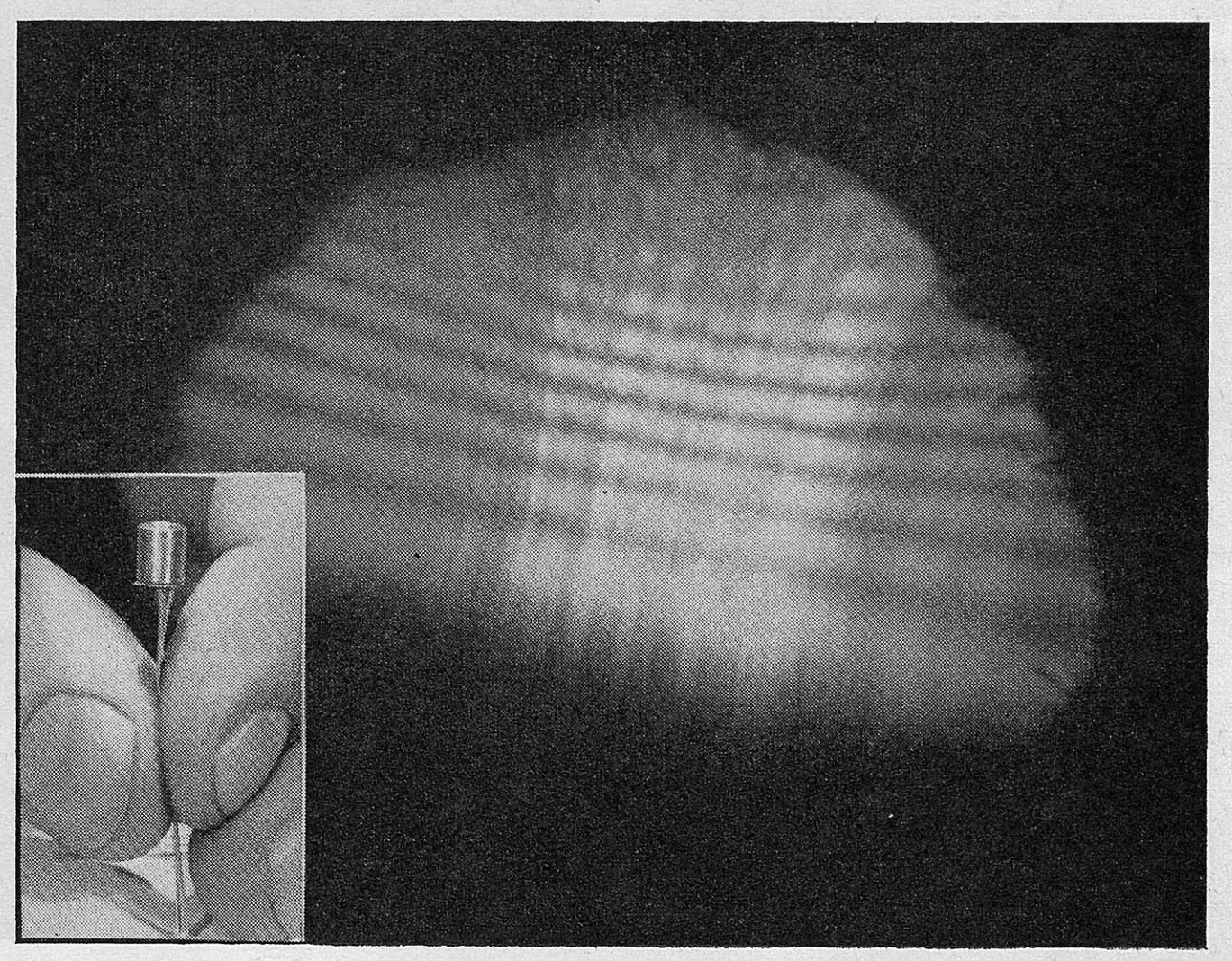
Signals from the satellite's various measuring devices are transmitted by a novel telemetry system designed by Martin. The heart of the system is a four-stage, completely transistorized 100-milliwatt two-channel transmitter.

Martin Alter is confident that his home-built satellite could successfully withstand the rigours of space. He doubts, however, whether his government will spend a rocket on it. " Rockets," he says, " are so expensive ".—CQ.

Laser man's photography

This photograph, released by International Telephone and Telegraph Corporation (ITT), shows the spatially coherent output of their gallium arsenide laser. It has been disclosed that this laser was produced by a process of crystal cleavage developed by ITT's affiliate, Standard Telephones and Cables Limited (STC). The device is pictured in the inset at lower left.

The pattern, photographed from the face of an infrared image converter tube, shows horizontal light and dark interference hands due to reflections from the base plate and therefore parallel to the plane of the device's pn junction. At right angles are a series of fine bright bands due to laser emission. When these bands



appear, spectral line narrowing is noted. Polarization is along the pn junction line. The bright bands show an interference pattern probably due to light from different points along the junction, and therefore indicate spatial coherence.—*ITT.*

Balloons for undersea cable markers

The firm Cable and Wireless is experimenting with balloons to increase the range of radar plotting of the buoys used to mark the route for underwater cables. The experiments are being carried out by the company's two cable ships, *Mercury* and *Retriever*, now engaged in the Pacific on the laying of the Compac cable from Suva to Hawaii.

The balloons, with radar reflectors attached below, are flown above buoys as the navigational aid for the ships. They are flown at heights varying from about 60 to 305 m. The first results of the experiments have shown that the buoys can now be plotted with more accuracy and at much greater distances. Normally ships' radar plots the buoys (the radar reflector is attached to the top of the buoy) 13 to 16 km away, but with the aid of balloons this range has been doubled. —*British Communications and Electronics.*

Experimental optical communication system

A laboratory model of a communication system which transmits and receives television pictures on a light beam generated by a laser device was demonstrated recently by General Telephone and Electronics Corporation (GT&E).

The demonstration was believed to be the first transmission by laser beam of a microwave signal-carrying television information.

" Microwave radio systems currently are providing excellent long-distance service, but laser beams, in contrast to radio waves, have far greater potential capacity," said Dr. Lee L. Davenport, President of General Telephone and Electronics Laboratories Incorporated.

A laser beam communication system has the theoretical capacity of handling simultaneously more than 100 000 telephone channels or more than 160 television programmes, compared with the maximum capacity of present broadband point-to-point microwave systems of 6000 simultaneous telephone channels or ten television programmes.

" Much development work remains to be done over the next five to ten years before optical laser communication links can be considered for application on a practical basis," Dr. Davenport noted. " The results of our current experimentation indicate that laser systems are most likely destined to serve a vitally important role in future communications. The greatest potential appears to be in communications from one space vehicle to another and, possibly, from earth stations to space vehicles. A number of scientific breakthroughs are required, however, before earth-to-earth communications can be considered feasible."

In the demonstration, a conventional television broadcast signal and a continuous microwave signal were applied to a travelling wave tube, and the resultant video-modulated microwave signal was fed into an electro-optic light modulator through which a laser beam was being projected. When the laser beam emerged from the modulator, it carried the video information superimposed upon the microwave signal.

The transmitter beam was relayed to an experimental optical receiver in the same manner that information is beamed from one microwave station to another, with the detected video picture shown on a television viewing monitor.

The laboratory system was designed by Mr. Samuel M. Stone and Mr. Louis R. Bloom, GT&E Laboratories scientists. Mr. Stone is shown observing the laser-transmitted television picture (left centre) while tuning the system's optical modulator. The laser device operates in the foreground, and a conventionally transmitted television picture is shown (left rear) for purposes of comparison.—*GT&E.*

scientific research and telecommunication

by Maurice PONTE
Docteur ès Sciences
Membre de l'Institut
Président Directeur
Général de la C.S.F.

THIS SUBJECT IS AN EXCELLENT illustration of the interdependence of scientific research and applied science. It could even be said that, as telecommunication has a very wide range of application in the modern world, everything covered by the term " research " in physics, chemistry and even the social sciences, contributes to its development.

Moreover, the word " telecommunication " covers the world wide field of direct communication among individuals and peoples. Thus, while it primarily covers material connections, such as conventional cables, underground or submerged cables, coaxial cables, dielectric cables, radio relay systems (*câbles hertziens* in French) and all the associated equipment needed to provide the maximum number of channels on a given link, it also includes all the radar systems, navigational aids and many other media. The whole contributes towards such highly complex systems as space telecommunication and navigational control of vehicles of the " Mariner " type or earth satellites such as " Telstar."

The subject is, therefore, likely to be too comprehensive, since it includes all modern technical and technological activities, each of which contributes to the development of this essential means of expanding less developed areas, as telecommunication in the widest sense provides an essential factor in their activity, both internally and in their relationship to the whole world. This account must, therefore, be voluntarily limited to a few essential chapters more characteristic of " telecommunication " in the original sense of the term.

We shall therefore mainly deal with:

— the transmission of information,
— the nature of " active " elements, such as tubes or transmitting and receiving systems,
— progress resulting from research at the ends of connections (antennae),
— progress in certain basic circuits,
— power supplies for the whole.

Transmission of information

These are the problems to which probably most research has been devoted and which have given rise to all the others.

They may be summarily divided into two groups: one group has led to the development of telecommunication media, the other to a study of the intrinsic nature of information and the birth of a new science: cybernetics.

Media

Starting from the actual properties of circuits, the telecommunication engineer soon realized that the transmission of information " consumed " a frequency band which was higher in proportion as the information needed to be more complete and more rapid. The telegraph as known to

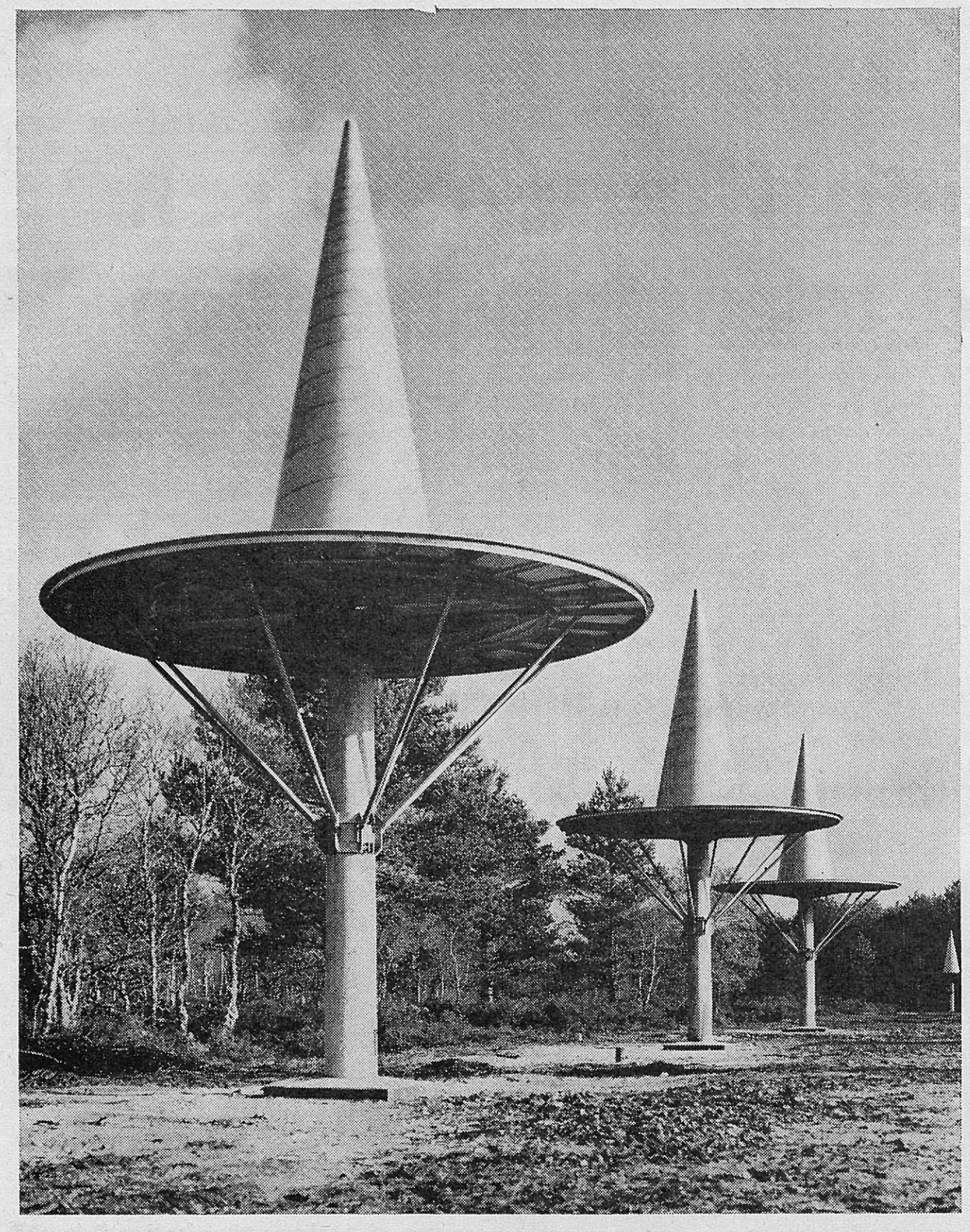


Figure 1 — Antennae of the East-West branch of the satellite-tracking interferometer, erected in the grounds of the annex to the Observatoire de Meudon, at Nançay (France)

(Photo : CSF)

our great-grand-fathers needed only a few cycles per second: television requires several million. The transmission carrier must therefore have an increasingly higher frequency: in forty years the frequencies of radio émissions have extended their spectrum from ten thousand cycles to thousands of millions. The sum total of scientific research of all kinds which has made this extension possible is enormous, since basic principles have had to be determined, components designed and propagation of these various frequencies studied.

As regards research into propagation, telecommunication needs led physicists to study from the ground the more or less ionized layers surrounding the earth in order to predict propagation conditions. The nearest layers were thus very well known before the appearance of earth satellites. The latter led to direct research, which enabled physical structure of these natural plasmas and the laws of their interactions with the earth's magnetic field to be determined.

The " race for high frequencies " has for years absorbed the activity of thousands of research workers, and at present the field of millimetric and decimillimetric waves has to a large extent been explored, owing, in particular, to the use of such waves for propagation on cables of suitable internal structure.

Nature and limit of information

The limits imposed on complete transmission of a given message have caused telecommunication technicians to analyse the actual nature of the information, in order to transmit only what is essential and to increase the sensitivity of the link. Their efforts have thus led to the establishment of a physical relationship between the actual information and its transmission system. This has also given rise to a whole art of operation, summarized in the term " information processing," in increasingly complex storage devices.

The progress in transmission thus achieved is of particular importance to under-developed countries; there, as elsewhere, advantage may be taken of the fact that their telecommunication networks are still under-developed and thus do not have to use installations based on out of date principles. They can from the outset " go modern " and immediately use the most recent operating techniques. As regards radio transmissions, the frequency spectrum is already very congested; the appearance of the needs of new nations is liable to raise insoluble questions unless use is made of the most advanced means of transmission technology and information theory. This will be particularly so in the case of broadcasting, if each new nation is to have its own programmes. It will be necessary to set up

synchronized networks and to make use of the most recent results of research into frequency stabilization.

Finally, it is probable that less developed countries will have to accept the consequences of information research as regards the adaptation of their languages and even their habits of thought: the literary subtleties of very analytical languages can no longer be transmitted at the cost of wasting technical resources, and all nations must prepare themselves to use one or more international languages, adapted to needs of transmission: this is one of the reasons for research into translating machines, which will mean machines for coding and decoding, but only within certain limits.

Research into essential components: tubes and semi-conductors

The race for high frequencies has led physicists and technologists to solve a number of problems connected with electronic tubes. In twenty years the limits of use of conventional tubes have been extended towards UHF, but only by tricks of design incompatible with the very long life needed by telecommunication. The majority of tubes used above 300 Mc/s make use of exchanges of energy between electron beams and fields actually inside the tube. The families of tubes which have thus been created, magnetrons, klystrons, travelling wave tubes, magnetron travelling wave tubes, carcinotrons etc. have given rise to so much research that, as concerns high powers, tens of useful kilowatts are obtained with peak powers of several tens of megawatts, if necessary, and as regards high frequencies, EHF and decimillimetric waves are reached.

These various tubes are used either for transmission or for reception. As always in telecommunication, tubes have had to be adaptable to the transmission of wide bands, a circumstance which has conditioned much research: certain tubes can operate up to an octave (magnetic travelling wave tubes, carcinotrons) as a result of mathematical and physical research on transmission lines and couplings with a beam of associated electrons.

It is of interest to note that at present research in the radio sense leading towards " higher " frequencies, and research in the optical sense leading towards "lower" frequencies, are meeting (laser application).

To show how far transmission technicians have furthered research and technology in electronics, we must also point out that submarine telephone cables require electronic tubes with an almost unlimited life.

Reference must also be made to progress in semi-conductors, a description of which would go far beyond the

Figure 2 — Spectrometer designed to study the atmospheric absorption of EHF waves. The 37-100 Gc/s band is explored continuously. Basically, the layout comprises, arranged side by side, a transmitting equipment and a receiving equipment and, some distance away, a plane reflector.

(Photo : CSF)

scope of this paper. But they have opened the way to modern mobile transmission systems, particularly satellite equipment.

" Non-material connections: antennae "

In connections of this type, the antenna is an essential element which, at the lowest cost, must adequately suit the nature of the connection to be provided. It is of interest to note that this problem has engaged the attention of scientists and technicians since the beginning of radio; as far back as 1912 it was found that the efficiency of circuits was basically governed by the choice of antennae and this led to prolific research into antennae and their associated apparatus in terms of frequency: large Beverage antennae, Chireix type beam antennae, followed, as frequencies rise, by mirrors and lattices resembling natural crystal structures. Research is still continuing.

The antennae used in the various forms of radio must have characteristics appropriate to the particular problem studied. The aim of research in this field has, therefore, been to achieve these characteristics. Sometimes this research has resulted in new types of antennae; at other times optical processes have been adopted to a lower frequency range.

Modern antennae may be grouped according to their type of operation, i.e. axial radiation antennae, broadside antennae, special antennae.

Generally speaking, while the results would seem to stem from pure technology or the engineering of structural resistance, they have required enormous theoretical work involving the most advanced mathematical equations in the theory of electro-magnetic propagation. Heaviside was a pioneer in the art of applying mathematics to problems of this type, which have led to mathematical research opening much wider horizons.

Neither should it be forgotten that, owing to the development of telecommunication requirements, antennae, like tubes, must " pass " increasingly wide frequency bands, with suitable matching at transmission and reception; years of theoretical and practical research have been necessary to reach the present stage.

Finally, the most immediate motive for research in this field is now provided by the demands of space transmissions, particularly as regards the precision required for the diagrams. This question is of particular importance in less developed areas, as satellites provide them with an essential means of telecommunication with the outside world.

Axial radiation antennae

Although radiating structures of the Yagi or rod type have been in use for a long time, understanding of their operation is recent. New structures for sporadic modes of propagation have been designed, using teflon or other artificial dielectrics.

Periodic modulation of the radiating structure has enabled the gain of such antennae to be increased and has created the " cigar " antenna used in television for some VHF relays.

The excitation of such types of antenna, however, pre sented some difficulties: the idea of progressive coupling of one to another capable of radiating the energy has made it possible to solve the problems of excitation in very wide frequency bands. One example is the " sausage " antenna, where the frequency band may reach an octave. This type of antenna has been used in telemetering and is to be used in television and radio relay systems.

Normal radiation antennae—Broadside

Some optical techniques have been successfully applied to the designing of high-gain cold antennae; in particular steerable antennae for satellite tracking employ new parabolic or spherical mirror excitations derived from optical systems, e.g. of the Cassegrain type.

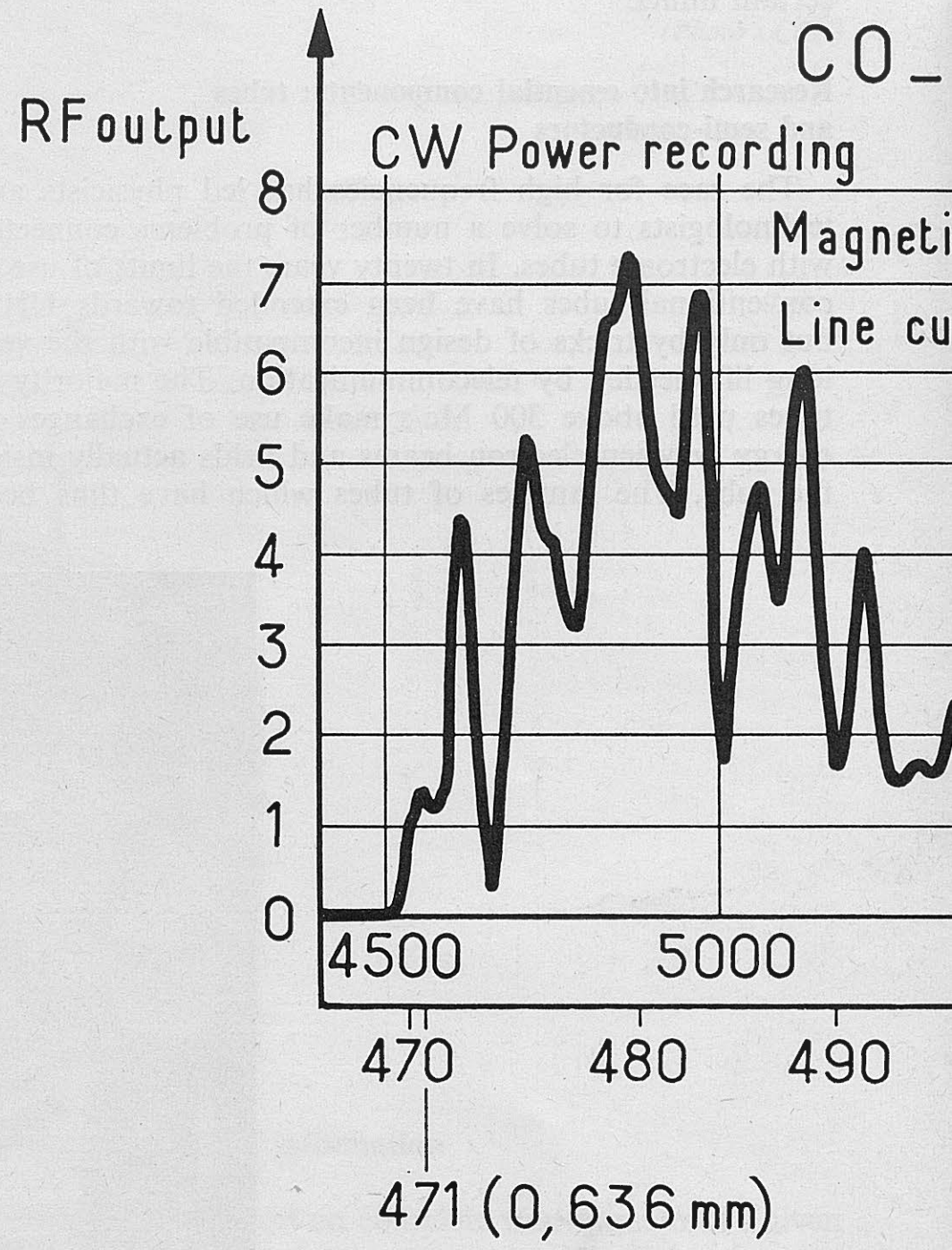


Figure 3 — *CARCINOTRON graph 0.6 mm*

Metal lenses consisting of perforated plates have given excellent focussing. They have been used in some radio relay systems.

Lastly, some improvements based on calculations and experiments have been made in traditional fields, such as antenna arrays or omni-directional antennae.

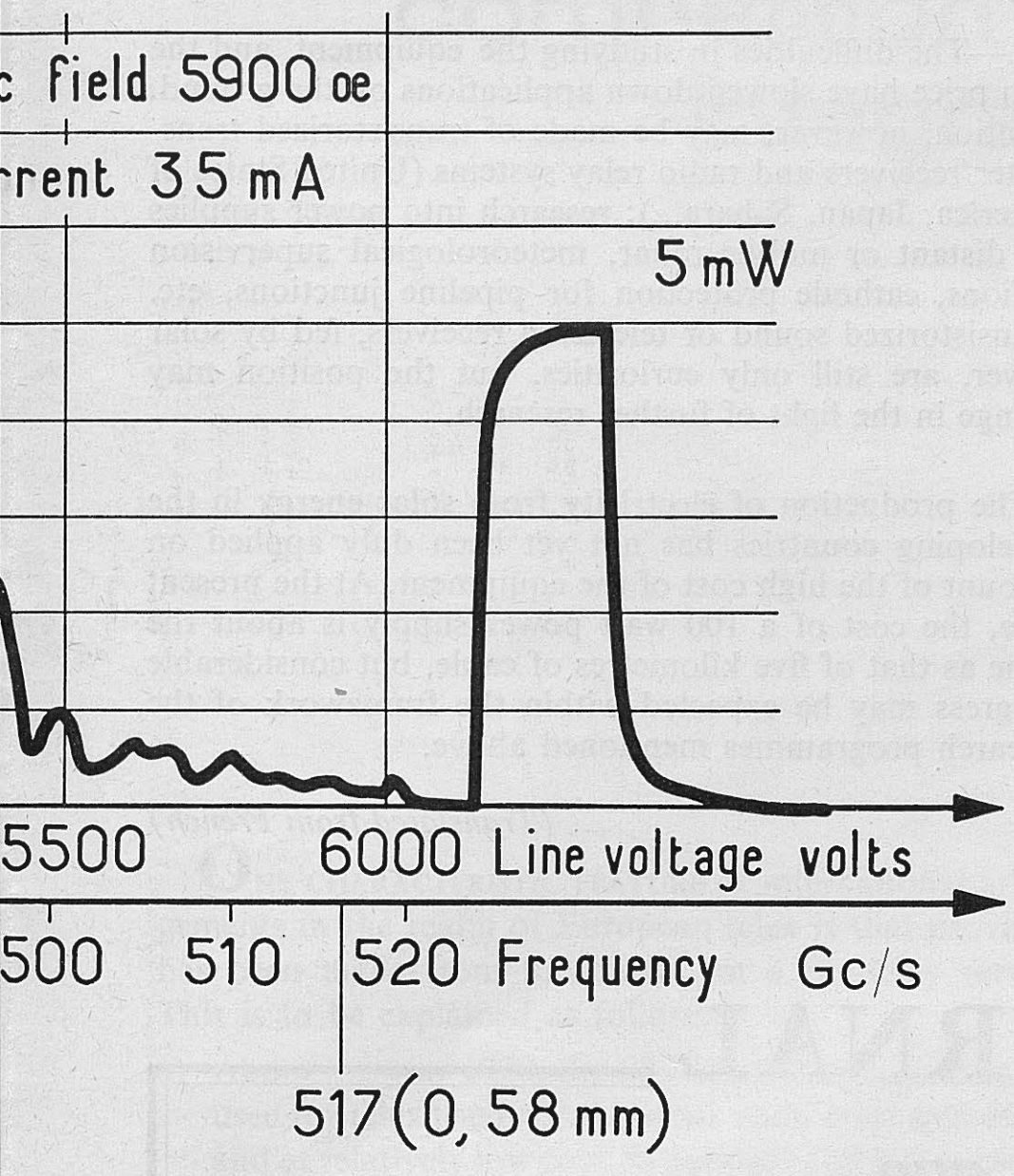
Special antennae

Recently, two new principles for antennae have enabled bands of several octaves to be reached. These are logarithmic arrays and " corner " and " conical " antennae. The geometry of these structures is independent of the wave length, except at the ends.

There is a very large variety of such antennae, which are used either as a primary source of excitation in arrays,

or in interferometers. Research is continuing at present on active antennae in which the amplifying function is achieved on the actual structure of the antenna.

Finally, we may mention the work done in the field of " synthetic antennae ". In these, elements of conventional antennae are combined with auxiliary appliances (phase-changers, correlators, computers). In particular, it is possible to improve signal reception by making use of their characteristics.



- Power curve of the carcinotron CO.06; wave-length 0.6 mm.

Research into basic circuits

Electric circuits are associate basically reactive elements with the object of obtaining transmission frequency curves of a given shape: in other words, selectivity curves.

Modern telecommunications require circuits to be so designed that, combined with the active components such as tubes and transistors, they must possess very precise transmission characteristics, owing to the very large number of equipment units involved (e.g. chain of radio relays), and the quality required for such units.

This precision is designed to ensure:

— a high degree of amplitude regularity within the passband emitted,
— a very rapid fall in transmission outside this channel, to provide protection against unwanted signals.

Moreover, amplitude regularity is not the sole criterion: especially for transmissions using frequency modulation, there is also the necessity of achieving phase linearity, expressed by the constancy of the group delay.

Scientific research in this field first helped to improve the results obtained by introducing *calculation methods* based, much more than formerly, on higher mathematics. We shall merely quote the generalized introduction of the Laplace transforms and of matrix algebra for the analysis of electric circuits and the consideration of criteria based on rigorous mathematical notions as a means of rationally regulating transmission: Butterworth's maximally flat circuits or the Chebyshev response. At the same time, methods of calculating " pass-all " equalizing circuits designed to regulate group delay have been developed much more intensively.

This theoretical aspect is completed by the practical aspect of *circuit design*. Here, too, great progress has been made or will be made in the near future as a result of scientific investigation.

We shall select a few examples:

a) Modern work on magnetic substances has for several years led to the development of oxides of iron, nickel, zinc or manganese known as ferrites. These magnetic substances have the merit of possessing a high permeability, which can be used at the highest frequencies according to their composition. They have made possible the practical design of a number of closely-coupled high-Q circuits, the importance of which was shown by theoretical calculations but which had not so far been a practical proposition. Among the more recent examples are transistorized IF amplifiers for radio relays possessing a regular and extended bandwidth (50 Mc/s or more).

Two further fields may be mentioned in which scientific research will certainly foster considerable progress in circuit technology.

b) *Supra-conductivity*. Stanno-niobium wires, immersed in liquid helium by various techniques, have provided high current densities, enabling, for instance, strong magnetic fields to be created.

c) " *Integrated* " *micro-electronic circuits*. As a result of constant progress in treatment technique, it is expected that circuit elements will be produced actually inside the semi-conductor blocks used in the designing of active elements: diodes and transistors.

Thus it appears that circuit technique is in a constant process of development as a result of parallel improvement in methods of calculation and in processes of technological design, whereby recourse is had once again to the most advanced results of research into modern physics and chemistry.

Power supplies

Telecommunication equipment naturally requires an electric power supply. Research has tended to be of various types, i.e. to examine

— increased output from convertors, which has led to new rectifiers or inverters, either gaseous or solid;
— reduction of the power required, especially for mobile equipment, one of the factors in the generalized use of semi-conductors.

However, the operation of telecommunications in less developed areas has given new motives to research springing from the need to use local sources of power, since distribution systems there are still under-developed. Another new motive is the power supply of satellites and, particularly in this case, of Telstar.

Scientific studies have been particularly intensive in the field of conversion of solar energy into electric power.

The solar energy available, at sea level and with the sun at its zenith, is of the order of 1 kW per square metre. In space, this figure is somewhat higher, of the order of 1300 watts per square metre. A number of physical phenomena are now being studied or used to make direct conversion into electric power: these may be divided basically into photo-electric effect, thermo-electric effect and thermo-ionic effect.

The photo-electric effect at present uses cells formed of p-n junctions in monocrystalline silicon, with a maximum output of the order of 15% and a usable output of 6 to 9%. These cells provide the optimum practical output at present available. They have, however, certain disadvantages: they are costly, they have low resistance to radiation and require heavy auxiliary equipment.

Hence, present-day research is turning to other substances (gallium arsenide, cadmium sulphide, etc.) or other forms of silicon and its compounds. An output of 3 to 5% on the ground would seem to be possible at present at a lower cost per watt.

The thermo-electric effect using the heating of a junction, raises problems of absorption and emission for the collectors and of stability for the substances employed. Output at present is low: 2% for small surfaces, 1% for large surfaces. The theoretical output, when substances operating at high temperatures are available, may reach 12 to 15% and this is a solution which will be particularly interesting for space communications.

The thermo-ionic effect makes use of the difference in electronic extraction between a cathode heated to about 2000° and an anode at a lower temperature. The overall output may reach 20 to 25% and the relation between the available energy and the weight is the highest. However, much further research will be required, especially to obtain long life.

Applications to telecommunication

1.—In space travel, all the electric power is provided by the conversion of solar energy into electricity by silicon cells, with the exception of a few trials with radioactive products. The power available varies from about 20 to 200 watts. It seems that in the next two years this conversion principle will be kept and the useful power may reach 500 watts to 1 kilowatt.

2.—The difficulties in studying the equipment, and the high price have slowed down applications on the ground. Mention, however, may be made of transistorized transmitter/receivers and radio relay systems (United States of America, Japan, Sahara...); research into power supplies for distant or mobile radar, meteorological supervision stations, cathode protection for pipeline junctions, etc. Transistorized sound or television receivers, fed by solar power, are still only curiosities, but the position may change in the light of further research.

The production of electricity from solar energy in the developing countries has not yet been duly applied on account of the high cost of the equipment. At the present time, the cost of a 100 watt power supply is about the same as that of five kilometres of cable, but considerable progress may be expected within the framework of the research programmes mentioned above.

(Translated from French)

THE JOURNAL

fifty years ago

Telegraph legislation

Serbia

Law of 3 December, 1898

ART. 5.—Telephone correspondents shall themselves be responsible for establishing their respective identities.

. . . . . .

News

London-Berlin telephone.—The first telephone conversation between a subscriber in London and a subscriber in Berlin took place recently. Several tests had previously been made between these two cities *via* La Panne (Belgium)-Brussels-Cologne and Düsseldorf. The circuit is 1100 km in length. Reception between London and Cologne is still excellent, but between London and Berlin speech is of course less distinct ; nevertheless, it was possible to conduct a conversation for some minutes without difficulty. Tests have also been made, *inter alia*, between London and Aachen, London and Düsseldorf and London and Hamburg. Between these two latter points, however, reception was very difficult, whereas conversations between London and Düsseldorf or Cologne, could be taken down by shorthand without difficulty.

(Elektrotechnische Nachrichten)

JOURNAL TÉLÉGRAPHIQUE — May 1913

TELEX AND GENERAL TELEGRAPHY

competition and integration

by
T. PERRY

Department of Posts,
Telegraphs, and Telephones,
The Hague

ONE CHARACTERISTIC FEATURE of international arrangements in the realm of European telex is that provision has been made from the outset for a no-delay service. This is to be explained as follows:

a) About the year 1930, the fifty-baud telegraph channels used for telex traffic could be set up in great quantities, and at relatively low cost, in national and international telephone cables, which were becoming steadily more numerous. Hence it was possible to plan telex circuits for high-speed traffic to cope even with the busiest periods. The financial risk involved was very slight.

b) It could reasonably be supposed that most Administrations would shortly be introducing automatic working into national telex networks. That, in the near future, would render possible the semi-automatic routing of international traffic.

It was expected that international telex traffic would become fully automatic in the not too remote future.

High speed was considered essential if international telex traffic [1] was to experience a rapid growth. This has been fully borne out by facts.

At the present time fully-automatic telex working exists in communications between numerous European countries.

In many instances, semi-automatic working has been introduced. This fact, together with the no-delay use of manually-operated circuits where they still exist, means that in Europe practically the only reason for a telex hold-up is the occupation of the called subscriber's line.

International telex rates

The Administrations which, from 1930 to 1940, were the first to introduce telex working, decided that telex rates should provisionally be harmonized with those for telephone calls over the same circuits. Pending such time as rates could be based on actual costs (which could be assessed only in the light of experience), it was agreed that telex charges should be half those for telephone

---

[1] The statistical tables attached to the *Telecommunication Journal* for November, 1962, shew that international telex traffic carried in 1961 can be assessed at about 120 million minutes of call, about twice as much as the figure for 1958, almost six times as much as that for 1954; and ten times as much as for 1952. For the Dutch Administration, incoming traffic representing some 10.7 million minutes was handled automatically or semi-automatically, as was the case for the traffic carried by inter-continental wireless circuits. More than 95% of Dutch outgoing traffic (in 1961, about 11.5 million minutes) is fully automatic. Half of the remaining traffic is put through semi-automatically. Where fully-automatic outgoing traffic exists, manual operation has been done away with (and semi-automatic working as well). Hence the Amsterdam international telex position handles only such outgoing traffic as proceeds towards countries with which automatic working has not yet been set up.

calls. As in telephony, a minimum charge as for three minutes of call was levied. When, in 1948, the first Regulations for international telex were evolved in Brussels, the Plenary Assembly of the International Telegraph Consultative Committee (CCIT) kept to the provisional system described above " except where other arrangements might be made among the Administrations concerned."

After a few years, such arrangements had already been made among a few Administrations which had decided to introduce fully automatic working in telex services among themselves. As part of these agreements, the minimum charge for three minutes of call, together with the charging areas used in telephony, were done away with.

In 1956, further to investigation, the International Telegraph and Telephone Consultative Committee (CCITT) drew up (Recommendation F.66) new charging rules, independent of those for telephony, and based on costs (for the present wording, see Volume II*bis* of the CCITT Red Book, New Delhi, 1961, pages 259-260).

In the existing Telex Regulations, there are two possibilities, when fully-automatic working is used and the minimum three-minute charge has been dropped. They are:

a) a charge per minute of call;

b) charging by periodical pulses, as used in the national automatic service.

System *b)* is used for most European traffic.

A point to notice is that the Telex Regulations urge transit Administrations and Recognized Private Operating Agencies to adapt their charging procedures to the arrangements made between terminal Administrations and Recognized Private Operating Agencies.

Further to the above developments, telex rates, and especially rates for short calls, are sometimes very low in relation to telegram charges. Indeed these rates are most attractive even if compared with the rates for telephone calls where the three-minute charge is still applied or where charging areas are still in use for long-distance calls.

In support of the above, the table opposite gives some information about the Dutch service. A remarquable thing to note is that sometimes one can correspond by telex long enough to send from 15 to 35 words, for a charge equal to between 100 % to 200 % the rate per word of a telegram. In some instances, a telex call is possible for three minutes or even longer, for the same charge as the minimum charge for a telegram (seven words).

In inter-continental communications, the position is not the same. Here telex communications are costly. Hitherto, too, a three-minute minimum has invariably been levied. But when a message has a good many words, telex charges, here again, are not very expensive when compared with those for telegrams.[2]

[2] Certain Administrations are now preparing fully-automatic inter-continental telex, dropping the minimum three-minute charge.

Competition

From the above, it will be seen at once that telex is a very serious competitor for general public telegraphy. This by no means implies that telex competes with telegraphy in the overall sense, since Administrations and Recognized Private Operating Agencies themselves have introduced telex. Indeed, they have given a powerful boost to the telex service, rightly considering it to represent a new phase in the development of telegraphy. A " metamorphosis " of telegraphy might conceivably be an apter expression, so great has been the volume of new traffic generated.

In fact, of course, there is competition between all branches of telecommunication.[3] In the past, telephone calls have frequently ousted the telegram, keeping step with the development of telephone networks. In all likelihood, the telex service will lose part of its traffic to the telephone, as a result of the steady progress being made in introducing automatic telephony, if telephone charges are further reduced. And at present, we may reasonably assume that the telephone service has lost some of its traffic to telex, in view of the speed with which international automatic telex working has been introduced.

Firms possessing leased telegraph or telephone circuits will route a good deal of their traffic over such circuits, instead of having recourse to the general service, the telex service, or the public telephone. Very considerable is the volume of traffic now being carried on leased telegraph circuits. Airline companies, individually or in groups, news agencies, air safety services and weather offices now possess big leased-circuit systems covering the entire world, using the most up-to-date message-switch procedures. A few years ago, even the most optimistic would have been astounded by the number of messages now being exchanged.

Technical progress is unceasing. Data transmission and similar systems are exceedingly promising. Their effect on existing communication media and their depreciation (and we have seen equipment wearing out with surprising speed these last few years !) cannot be predicted.

Communication satellites are already circling the earth. Intercontinental telephone cables are becoming ever more numerous. All these things will one day become competitors.

In this connection, the airmail letter is already a serious competitor. Especially when a letter can be sent by aeroplane over immense distances in the course of a single night, users will often abstain from sending telegrams or making calls by telex or telephone. Thus, a letter despatched by aeroplane from Zurich to Amsterdam can be delivered the following morning (if sent at twenty minutes before midnight) in any major Dutch city, and by the first post. If a letter for New York be posted in Amsterdam before noon, it can reach its destination the following

[3] See, too, P. F. Eriksen's interesting paper in the *Telecommunication Journal* for December, 1962.

morning. Will this have any effect on telecommunication tariff policy ?

On the other hand, commercial correspondence hitherto carried on by post will now be carried by telex, which is cheap and speedy, and allows the use of semi-telegraphic language. There are examples of this phenomenon to be found in the correspondence exchanged among Administrations and Recognized Private Operating Agencies themselves; the telex message, quick and simple, is more and more tending to oust the costly letter written in a foreign language. In addition, the addressee generally replies without delay. A substantial success for telex !

when somebody makes a telephone call from a friend's home. Incidentally, there are numerous customers already using their telex equipment for this purpose, with the consent of the Administration or Recognized Private Operating Agency concerned: hotels, tourist agencies, transport firms, etc.

But if it became known (and such attempts have been made from time to time !) that agencies were being set up with this as their major activity, the competition might well not be acceptable to Administrations and Recognized Private Operating Agencies. We may reasonably assume that such agencies would not rest content

Overall view of the transmission room in the Amsterdam telegraph office.

First and second rows: tape teleprinters in the gentex service. Then the page printers of the telex service for handling telegrams in relation with subscribers

The word competition would also be appropriate if, making use of the facilities afforded by telex, subscribers were to transmit third-party messages, against payment. This would constitute a direct challenge to the monopoly claimed by Administrations and Recognized Private Operating Agencies.

Doubtless this practice is already fairly common, but can hardly be objected to as long as it is not systematic. Administrations and Recognized Private Operating Agencies could hardly object if, from time to time, a telex subscriber were to put his telex facilities at a business friend's disposal and settle the cost by agreement with the latter. This is hardly different from what happens

with handling correspondence from or to third parties without telex equipment. They would extend their activities to the handling of messages for the benefit of subscribers whose offices were closed. If, thereafter, a degree of co-operation developed among agencies in different countries, by virtue of which an agency would put through calls to clients in its own country over the local or national telephone networks, the competition referred to above might well assume formidable proportions.

This is why most countries lay down certain restrictions for connection to the telex network (there are also restrictions governing the lease of telegraph circuits).

Nevertheless, during the New Delhi discussions of the International Telegraph and Telephone Consultative Committee, the conclusion was reached that a restrictive clause should be included in the Telex Regulations, further to the clause already envisaged for agencies prepared to take over responsibility, for forwarding of telegrams.

This is how the clause is now worded:

" 2. Administrations and Recognized Private Operating Agencies should refuse to make the telex service available to:

a) a telegraph forwarding agency known to be organized for the purpose of sending or receiving telegrams for retransmission by telegraphy with a view to evading the full charges due for the complete route;

b) an agency known to be organized for the purpose of sending or receiving messages intended for transmission by telegraphy or telex."

Hence there will be grounds for proceedings against agencies such as those described above.

Table—Some rates in force in the Netherlands for fully-automatic telex calls, telephone calls, and telegrams

Countries concerned	Telex and Telephone			General Telegraph Service			
	Number of minutes	Rate in florins		Number of words	Rate in florins		
		Telex	Telephone		Normal	Urgent	Elt
Belgium	½	0.25	0.34 [1]	1	0.24	0.48	0.12
	1	0.40	0.66				
	1½	0.60	0.94				
	2	0.75	1.26				
	2½	0.95	1.54				
	3	1.10	1.86				
	3½	1.30	2.14				
	4	1.45	2.46	Minimum			
	4½	1.65	2.74	7	1.70	3.40	
				22			2.65
France	½	0.35		1	0.29	0.58	0.15
	1	0.65					
	1½	0.95					
	2	1.25					
	2½	1.55					
			3.00 [2]	Minimum			
	3	1.85	3.60	7	2.05	4.10	
			4.80	22			3.30
Norway	½	0.60		1	0.33	0.66	0.17
	1	1.15					
	1½	1.70					
	2	2.25					
	2½	2.80		Minimum			
	3	3.35	6.00	7	2.35	4.65	
				22			3.75
Federal Republic of Germany	½	0.35	0.46 [3]	1	0.28	0.56	0.14
	1	0.60	0.86				
	1½	0.85	1.26				
	2	1.15	1.66				
	2½	1.40	2.06				
	3	1.65	2.46				
	3½	1.95	2.86	7	2.00	3.95	
				22			3.10

[1] Rate for fully-automatic calls. For other calls, the rate is 0.60 Dutch florins per minute.

[2] Rate according to charging areas with three-minute minimum.

[3] Rate for automatic traffic with the first charging area. For manual traffic with the non-automatic part of the first area and with the two other areas, the rates are 2.10, 2.85, and 3.60 Dutch florins, respectively.

Telex operators in the Rotterdam telegraph office

But if such agencies were in a position to render services not provided by the competent authorities, or services which such authorities provide only at a considerably higher charge to the public, Administrations or Agencies might well wonder whether they would not be well advised to introduce new traffic facilities. We shall expatiate on this subject later.

Integration of the telex service and the general telegraph service

The question of integrating these two services has already arisen in several respects.

In most instances, both of them have a common head. They make common use of buildings, equipment, channels, laboratories, etc. The most characteristic example of such integration is to be found in instances where telex and gentex services make common use of circuits and exchanges. Integration has also taken place to some extent when general service telegraph offices themselves behave like telex subscribers. This is what happens, fairly frequently, when telegrams are handed in and delivered by telex. In the Netherlands, about 40 % of international telegrams are so routed.[4]

Hence such telegrams, most of which come from customers not connected to the telex network, or are sent to such customers, are partly carried by the general telegraph network and partly by the telex one. Since general telegraph offices communicate only with subscribers in their own sectors (sometimes with subscribers in a particular area, occasionally with subscribers throughout the country), use of the telex network is limited to the local or national sectors of the route followed by the telegram.

If it were desired to carry integration still further, there might be two possibilities:

a) In one country, a national telex subscriber might communicate with the general telegraph offices of another country, with a view to transmitting messages for local distribution or for delivery by telephone (in a particular area or anywhere within the country), or for re-transmission in accordance with national tariffs;

b) a telegraph office in a country (if possible, the sending office) might communicate by telex with a telex subscriber of another country to deliver messages handed in to that office as special-category telegrams.

The above procedures would result in the rendering of services very similar to those offered by the agencies we have been discussing. They do not, admittedly, cover traffic between customers who are not telex subscribers (assuming that these agencies might co-operate to handle

[4] Delivery by telex nearly always takes place because the addressee asks for it. Only rarely does the sender use the indication " TLX x ".

such traffic). But we may assume that the general telegraph service will deal with this at reasonable rates.

The procedure described in *a)* might be difficult to bring about within the near future; there are a number of unsolved problems in connection with attempts to communicate with general service offices abroad by telex (especially with the smaller offices), and in connection with accounting.

The procedure described in *b)* would seem at first sight a good deal easier to apply. In many instances, no major difficulty will arise, especially when the telex service is fully automatic and when the gentex offices in the sending country are connected to the telex network of the country of destination.

When fully automatic telex communications are available between two countries, every national telegraph office possessing an ordinary telex station can make direct contact with an addressee in the other country. If recourse has to be had to the gentex offices mentioned above, these latter offices alone may enter into communication with the addressee.

When a message is sent directly to an addressee in the country of destination by a telegraph office in the country of origin, all the operations which would normally take place in the former country for delivery of a telegram will be done away with (operations at the office of destination, and possibly at transit offices too). This being so, there is really no longer any " office of destination." Nor can we really talk about an " incoming telegram." All that now exists is an incoming telex message, transmission of which entails a very brief occupation of international and national telex circuits, and of the automatic telex exchanges. Hence it would seem reasonable to assume that the quotas due to the country of destination should be based on telex charges, which are a good deal lower than those based on the number of words, and no longer on the terminal charge per word. This applies to the quotas due to the transit countries, which can also be lower than those for a conventional telegram. The difference makes itself felt with a longer message. Here is an example which will make our thesis clear: for a thirty-word message from Switzerland to the Netherlands, the quota due to the Federal Republic of Germany, calculated according to the charge per word, amounts to sixty gold centimes, and that due to the Netherlands to 3.30 gold francs, making, all in all, 3.90 gold francs. The telex charges would amount to some 0.50 gold franc.

Hence it might be well to consider the introduction of a new class of message, at a rate lower than that for an ordinary telegram. However, as far as the public is concerned, the fact that such messages would usually be delivered faster than ordinary telegrams might outweigh the question of charges. If the sending office delivers the messages direct to the addressees, we shall have a no-delay service almost identical to that previously described for the telex service. This would redound greatly to the advantage of the public; indeed, the creation of such a facility might almost be considered something to which the public is entitled, since the technical means are already available.

This new class of telegram might prove very attractive to firms which are already telex subscribers, for the purpose of sending messages to subscribers with whom they normally communicate by telex, but outside their own telex operating hours, or to business correspondents abroad without a telex connection, or to their own representatives temporarily abroad, who would thus enjoy a faster, cheaper, telegraph service.

It would seem reasonable that when the sender hands in his message, he should give the telex number and full indicator of the addressee, for checking during transmission. The sender would also have to take responsibility for telex delivery, since, under No. 448 of the Telegraph Regulations, the addressee of an ordinary telegram can refuse telex delivery, even when the telegram bears the paid service indication " TLX x."

Clearly, to decide on the rate will not be easy.

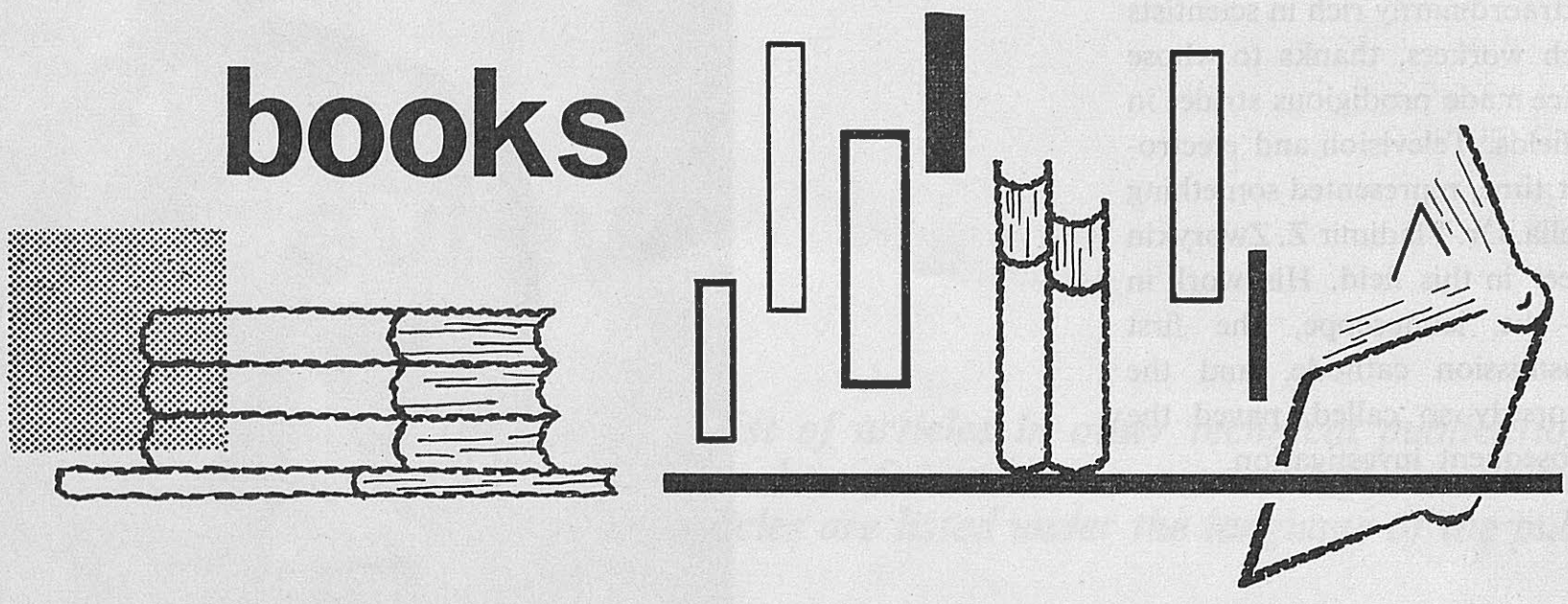
On the lines of the practice usually followed for calls made from public telex booths (available in some countries), the rate might be made up of the costs of the telex call as such, plus a remuneration for the services rendered by the telegraphist who, like the booth operator, transmits the messages. There are, however, arguments in favour of rates based on a remuneration per word, for the sending country, plus the quotas due to the other countries concerned in the communication (which will vary according to the number of words). Since telex subscribers are very often found to be engaged, rates will also have to cover the cost of repeated attempts to dial. Finally, the charges should include an amount designed to pay for transmission of the message over normal telegraph channels, when—as does occasionally happen—the line is found to be constantly engaged or out of order.

What should be the procedure to be followed with requests submitted through the general telegraph service ? This constitutes yet another problem.

All in all, then, the simplest course would seem to be a rate based on the number of words. Only a lengthy trial period will enable us to say whether a minimum charge for a fairly considerable number of words would be desirable. Such tests would enable us to assess, too, the public response to the creation of this class of message. If we compare the pros and cons of this kind of message with those of traffic exchanged from booths, we observe that there is one disadvantage for the sender, in that he cannot wait for an answer, so as to embark on a " conversation " with the addressee. He is not, on the other hand, obliged to repair to a booth, since he can ring up the telegraph office to hand in his message.

The European PTT Conference has called for investigation of the desirability or otherwise of dealing with further integration of the telex and general telegraph services at the international level. In the meantime, the service described above has been begun, tentatively, in services between the Netherlands, the Federal Republic of Germany, and Switzerland. It has been baptized the *Telexogram Service*. Throughout the trial period, telexograms will be subject to the charges in force for letter-telegrams.

(Translated from French.)



Technologie d'électronique — Matériel des télécommunications (Technology of electronics—Telecommunication equipment), by J. Mornand.[1]

This volume would be useful in the preparation of technical examinations and recruitment competitions. It respects modern standards and has more than three hundred drawings. Engineers in the electronic industries will find it valuable.

Contents include: Ideas on the composition of matter. Electrical properties of material used. Conductors, Insulators. Semi-conductors. Gas. Fixed resistance. Varistors, adjustable tesistance. Fixed condensers, adjustable condensers. Electronic rubes.

V. Meyer

[1] One volume paper cover; pp. IX+208, illustrations, tables, diagrams, formulae. 16×25 cm. Published by *Editions Dunod*, 92, rue Bonaparte, Paris 6e, 1962. Price 11 F.

●

Servicing transistor radios and printed circuits, by Leonard Lane.[2]

This book is based on one which has already enjoyed large sales in the United States of America and which has now been thoroughly adapted for the British market by E. A. W. Spreadbury, technical editor of "Wireless and Electrical Trader."

"Servicing transistor radios and printed circuits" covers typical American, British and Japanese transistorized A.M. receivers and transistorized and hybrid car radios. It aims to give, in the language of the practical man, a working knowledge of the theory of transistors as well as covering practical applications and techniques, including many details of American practice not normally published in this country. Printed circuits have been evaluated from the servicing standpoint and simple repairs to them are discussed. All the line drawings and circuits have been redrawn to conform with current British practice; the plates, the majority of which were specially prepared for the book, are typical of British transistors and servicing techniques.

Not of least importance in service work is economy in both time and money. Greater familiarity with circuitry and testing techniques undoubtedly leads to increased efficiency in correcting faulty equipment; damage to miniature components through careless handling can easily result in their otherwise unnecessary replacement. The author has therefore taken pains to explain how a systematic analysis should be carried out and also what precautions should be taken. The low voltages and currents associated with transistors are extremely deceptive; although an operating receiver can be probed with complete safety, many transistors are very delicate and may be easily damaged by even a momentary wrong connection, or careless soldering.

An excellent servicing guide is included which will form an indispensable source of reference on the test bench.

This book will appeal equally strongly to the amateur, the apprentice and the technician. To all of these it cannot be too highly recommended.

V. Meyer

[2] One bound volume; pp. IX+264, illustrations, tables. 22×14 cm. Published by *Iliffe Books Limited*, Dorset House, Stamford Street, London SE 1, 1962. Price 42 sh.

INTERNATIONAL RADIO CONSULTATIVE COMMITTEE (CCIR)

Smoothed monthly sunspot numbers — **1st May 1963**

Predictions for the coming months:

1963	May	19	June	18	July	16
	August	15	September	14		

(Values kindly provided by Prof. Waldmeier, Federal Observatory, Zurich)

THE PERIOD BETWEEN the two world wars was extraordinarily rich in scientists and research workers, thanks to whose efforts science made prodigious strides in all sorts of fields. Television and electronics, at that time, represented something of a Cinderella. Dr. Vladimir Z. Zworykin was a pioneer in this field. His work in developing the iconoscope, the first picture-transmission cathode, and the cathode properly so called, paved the way for subsequent investigation.

telepersonality

29 – VLADIMIR K. ZWORYKIN

Dr. Zworykin was born at Mourom, Russia, in 1889, in a family of engineers and teachers of science. His vocation was a precocious one. When no more than ten years old, he used to repair the electric signalling equipment on board his father's river steamers. Later on, he set up a telephone line within the family house; it was not long before he connected this to a neighbour's dwelling.

His vocation became still more evident when, at the Petrograd Technological Institute, he was studying under Dr. Boris Rosing, a distinguished professor of physics. In 1912, Dr. Zworykin graduated as an electrical engineer. Dr. Rosing's influence had been decisive during this period. Eager to acquire knowledge, the young Zworykin used to spend his leisure hours in Dr. Rosing's private laboratory. It was Dr. Rosing, too, who convinced his pupil that television would one day be realized by a system of cathode rays, rather than by some mechanical system.

In 1912, Zworykin entered the *Collège de France* in Paris, where he did research on X-rays under the eye of Paul Langevin. His studies were interrupted by the first world war, and he returned to Russia to join the army. After the war he emigrated to the United States, becoming a citizen of that country in 1924. Two years later he became a Doctor of Philosophy of the University of Pittsburgh.

Shortly after landing in the United States, Dr. Zworykin joined the Westinghouse Electric and Manufacturing Company, where he began research into the phenomenon of photo-electric emission and took up once more his studies in television.

In 1929, when the Radio Corporation of America (RCA) was reorganized, Dr. Zworykin joined that organization and for several years was director of its electronic research laboratory. In 1947 he was elected Vice-President and technical adviser to the RCA laboratories. Sometime after his retirement (in 1954), the Board of Directors of RCA conferred the honorary title of Vice-President on Dr. Zworykin, for the first time in the history of that company.

Since 1954, Dr. Zworykin has been Director of the Medical Electronics Centre in the Rockefeller Institute, New York, over and above his responsibilities in the Princeton Laboratories of the RCA.

His research interests have extended beyond television to electronics. To him we owe the " snooperscope " and " sniperscope " (electronic telescopes for long or short distances, making use of infra-red rays). He has done much, too, to develop the electronic microscope.

This inventor has more than a hundred and twenty patents in his name in New York. Several times decorated, a member of several scientific academies, the author of several books and technical articles, he is one of the outstanding scientists of our time.—F.S. *(Translated from French)*

review review review

A list of articles in other technical publications which may be of interest to readers of the Journal. The articles are listed under the language of the publication.

FRENCH

Electronique industrielle. 42, rue Jacob, Paris 6e. Année 1963. **N° 62.** P. 91-96. *van Baerle F. Ch. G.* Un simulateur de fonctionnement d'un réacteur nucléaire. — P. 99-102. *Dunou P. A.* Les diodes redresseuses à avalanche contrôlée.

Onde électrique (L'). 40, rue de Seine, Paris 6e. Année 1963. **N° 430.** P. 5-24. *Orsini J., Jocteur R.* Câbles coaxiaux THF à conducteur extérieur en aluminium. — P. 47-55. *Revuz J.* Régimes non linéaires dans les diodes « tunnel ». — P. 68-77. *Fagot J.* Application de la modulation de fréquence à la transmission du signal de chrominance de la télévision en couleur.

Radio constructeur et dépanneur. Société des éditions Radio, 42, rue Jacob, Paris 6e. Année 1963. **N° 187.** P. 76-78. *Serge M.* Les potentiomètres de puissance en radio. —P. 82-87. *Dartevelle Ch.* Etude et réalisation d'un récepteur de trafic.

●

ENGLISH

British Communications and Electronics. Heywood and Co. Ltd., Drury House, Russell Street, Drury Lane, London WC 2. Year 1963. **No. 2.** P. 107-111. *Benzie R. J., Darwent A. P.* An L-band high-power ferrite isolator.— P. 112-119. A survey of CCTV camera chains. — P. 122-128. *Allen S. G.* Microwave variable attenuators using p-i-n junction diodes.

No. 3. P. 198-199. *Gambling W. A., Smith R. C.* Masers and lasers. — P. 204-206. *Young J. L.* Post Office experience with polythene inland telephone cables.

No. 4. P. 264-269. *Beckley D. J.* The operation of a transatlantic telephone cable terminal. — P. 276-279. *Gosling W.* The tunnel diode-transistor trigger — some applications.

CQ the Radio Amateur's Journal. 300 West 43rd Street, New York 36. Year 1963. **No. 2.** P. 28-31, 90, 109. *Jones F. C.* The overtone-harmonic crystal oscillator. — P. 32-35, 92. *Hansen C. L.* Automatic RTTY and CW with multi-gates.— P. 38-39. *Brown F. W.* A " G-line " for UHF. — P. 54-84, 86. *Jacobs G.* Space communications.

●

GERMAN

Archiv der elektrischen Übertragung. S. Hirzel Verlag, Stuttgart. Jahrgang 1963. **Nr. 2.** S. 69-74. *Bretschneider G.* Über eine neue Klasse einstufig erreichbarer idealer Anordnungen von Fernsprechleitungen.

Nr. 3. S. 121-130. *Werle H.* Backscatter- und Impulsfernübertragungsversuche auf der Funkstrecke Lindau/Harz — Tsumeb/Südwestafrika. — S. 145-150. *Widdel H. U.* Zur Ausbreitung horizontal und vertikal polarisierter Ultrakurzwellen in verschiedenen Geländeformen bei niedrigen Antennenhöhen.

●

RUSSIAN

Электросвязь, Ул. Горького, 7. Москва, К-9. 1963. **№ 1.** Стр. 13-16. *И. И. Селезнев, М. С. Сафин, А. Д. Тараненко.* Метод и Аппаратура для Измерения Мощности Побочных Излучений Коротковолновых Передатчиков. — Стр. 31-35. *Л. А. Севальнёв.* Требования к Стабильности Уровней Сигналов Цветности в Системе Цветного Телевидения с Вынесенными Поднесущими. — Стр. 48-51. *Г. П. Дивногорцев, Л. С. Уринсон.* Влияние Амплитудно-Частотных Искажений в Каналах Связи на Передачу Импульсных Сигналов. — Стр. 52-63. *Е. К. Иодко.* Оптимальные Параметры Ретрансляционных Телевизионных Станций при Использовании Радиорелейных Систем Связи.

№ 2. Стр. 16-21. *Ч. Ц. Цыдыпов, В. Н. Абарыков, В. И. Горячкин, В. В. Кузнецов.* Исследование Напряженности Поля Телевионных Передатчиков за Пределами Прямой Видимости. — Стр. 22-28. *Ю. В. Аксёнтов, П. М. Копылов.* Допустимые Изменения Уровней Первичных Сигналов в Системе Цветного Телевидения. — Стр. 48-57. *Д. Фарбер.* О Соотношении Мощностей Тепловых и Нелинейнных Помех в Многоканальных Системах с Транзисторными Усилителями.

●

CHINESE

Taiwan Telecommunications Technical Quarterly. Changsha Street, Taipei, Taiwan. (Separate English summaries.) Year 1962. **No. 1.** P. 4-10. *Miao T. V., Liang K. P.* The International Telecommunication Union and space communications. — P. 11-19. *Shen S. L.* A global system of communication satellites. — P. 30-38. *Wang M. H.* Communication satellite. — P. 44-49. *Huang Y. C.* Considerations on a nation-wide communications satellite system in China.— P. 70-76. *Chao T. H.* Reliability of components for communication satellites.

JAPANESE

Journal of the Institute of Electrical Engineers of Japan. 2-8 Fujimicho, Chiyodaku, Tokyo. (Separate English summaries.) Year 1962. **No. 7.** P. 879-886. *Hiroichi Teramura, Nobuhiro Azuma.* A fully electronic telegraph switching system using parametrons. — P. 895-902. *Masao Saito.* New synthesis methods for variable single frequency eliminating RC networks. — P. 902-910. *Shigeru Mita, Takeo Takeya, Syuichi Hayashi, Kenji Kakizaki, Takashi Yoshida.* Experimental results of pulse radars employing a circulator and traveling-wave tube.

MULTILINGUAL

Technische Mitteilungen PTT — Bulletin technique PTT — Bollettino tecnico PTT. Administration des télégraphes et des téléphones, 6 Speichergasse, Berne. Année 1963. **N° 2.** P. 35-43. *Buttex G.* Méthodes d'exploitation pour l'établisse-ment des communications payables à l'arrivée.

N° 3. S. 85-88. *Brunold A.* Korrosionen an Kabeln vom Typ F mit Thermoplastisolation. —. P. 89-96. *Moeckli Th.* De l'espace et de son statut juridique.

official announcements

Radio Regulations, Additional Radio Regulations (Geneva, 1959)

The Governments of the **Republic of Cyprus, Guatemala** and the **Republic of the Chad** have approved the Radio Regulations and the Additional Radio Regulations (Geneva, 1959).

Telegraph and Telephone Regulations (Geneva, 1958)

The Governments of the **Republic of Cyprus** and **Guatemala** have approved the Telegraph and Telephone Regulations (Geneva, 1958).

International Radio Consultative Committee (CCIR)

The **Stanford Research Institute,** in Menlo Park (California), has asked to participate as a scientific organization in the work of the CCIR.

This request has been approved by the United States Administration.

The Company **STET - Società Finanziaria Telefonica,** in Rome, has asked to participate as an industrial organization in the work of the CCIR.

This request has been approved by the Italian Administration.

The **Railway Association of Canada,** in Montreal, has asked to participate as a recognized private operating agency in the work of the CCIR.

This request has been approved by the Canadian Administration.

International Telegraph and Telephone Consultative Committee (CCITT)

The Company **AET - Applicazioni Elettro-Telefoniche,** in Turin, has asked to participate as an industrial organization in the work of the CCITT.

This request has been approved by the Italian Administration.

Invitations accepted to conferences or meetings external to the Union

Date	Organization or Host Country	Nature of conference or meeting	Place	Representatives
1963				
16 April-4 May	International Civil Aviation Organization (ICAO)	Special COM Meeting (1963)	Montreal	Mr. J. A. Gracie, Mr. J. Ziołkowski (IFRB)
8 May-8 June	United Nations Organization (UNO)	Third Session of the UN Ports and Shipping Training Centre	Copenhagen	Mr. R. Petit (IFRB)
5-6 June	International Radio-Maritime Committee (CIRM)	Thirty-third meeting of the Technical Committee	Copenhagen	Mr. R. Petit (IFRB) Mr. Leslie W. Hayes (CCIR)
24-26 June	United States of America	Antarctic Radio Communications Meeting	Washington	Mr. V. R. Sundaram (General Secretariat)

Calendar of ITU conferences and meetings

Date	Title	Place
1963		
	International Telegraph and Telephone Consultative Committee (CCITT) and **International Radio Consultative Committee (CCIR):**	
20-31 May	Plan Sub-Committee for Latin America and RIT Committee (Inter-American Telecommunication Network)	Bogota
End of November and beginning of December	Plan Committee	Rome
	International Frequency Registration Board (IFRB):	
22 April-3 May	Seminars on frequency management and the use of the radio frequency spectrum: Seminar in Spanish	Geneva
	International Telegraph and Telephone Consultative Committee (CCITT):	
6-14 May	Working Party of Study Group IV (Variation of equivalent)	Geneva
13-15 May	Working Party of Study Groups I, VIII and Special A, on " Telegraph Alphabet "	Geneva
16-21 May	Working Party of Study Groups I, VIII and X on " Retransmission of messages "	Geneva
22-27 May	Working Party of Study Groups I and X on " World-wide telex plan "	Geneva
28-31 May	Study Group X (Telegraph switching)	Geneva
28-31 May	Working Party of Study Groups I and XIV on " Phototelegraphic Regulations "	Geneva
27 May-1 June	Working Party of Study Group IV (Automatic measuring)	Stockholm
4-6 June	Study Group VIII (Telegraph apparatus)	Geneva
7-13 June	Study Group XIV (Facsimile)	Geneva
10-14 June	Study Group XII (Telephone transmission performance)	Prague
14-21 June	Study Group IX (Telegraph transmission)	Geneva
19-28 June	Working Party of Study Group XIII (Statistics on quality of service)	Brussels
24-28 June	Study Group XVI (Telephone circuits)	Geneva
18 September-15 October	Working Parties of Study Group IV, and Study Group IV (Maintenance)	Geneva
23 September-4 October	Special Study Group A (Data transmission)	Geneva
7-25 October	Study Group XI (Telephone switching)	Melbourne
	Study Group XIII (Automatic networks)	Melbourne
	Special Study Group B (Intercontinental automatic network)	Melbourne
November	Study Group V (Protection)	Geneva
	Working Parties of Study Groups V and VI, and V and XV	Geneva
	Working Parties of Study Group XV (Transmission systems)	Geneva
	Working Party of Study Group XII (Laboratory)	Geneva
29 April-End of May	**African VHF/UHF Broadcasting Conference**	Geneva
4-24 June	**Second Session of the Panel of Experts to consider measures to reduce congestion in the frequency bands between 4 and 27.5 Mc/s**	Geneva
7 October	**Extraordinary Administrative Radio Conference on Space Communications**	Geneva

List of recent and forthcoming publications of the International Telecommunication Union

The following letters indicate the languages in which documents are published:

F *for French* **S** *for Spanish*
E *for English* **R** *for Russian*
C *for Chinese*
Prices are in Swiss francs

Note

A comprehensive list of all the publications of the Union will be supplied free on request.

I. Publications issued since the last number of the Journal

Summary of Monitoring information received by the IFRB.
No. 80 (January, 1963)
Trilingual edition **F, E, S.**

Alphabetical List of call signs, 1st edition, (List VII. B.)
Multilingual edition **F, E, S, R, C.**

Table C (Total charges in centimes of gold franc of European system)
Editions in separate languages **F, E.**

Financial Operating Report, 1962.
Editions in separate languages **F, E, S.**

II. Forthcoming publications

Summary of Monitoring information received by the IFRB.
No. 81 (February, 1963)
Trilingual edition **F, E, S.**

High frequency broadcasting schedules
(4 publications per annum).
Trilingual edition **F, E, S.**

List of international telephone routes, 3rd edition, 1st January, 1963.
Trilingual edition **F, E, S.**

List of ship stations, 3rd edition.
Trilingual edition, **F, E, S.**

List of radiodetermination and special service stations, 2nd edition, 31 March, 1963.
Editions in separate languages **F, E** (possibly **S, R, C**).

Annual Report by the Secretary General, 1962
Separate editions **F, E, S.**

List of fixed stations operating international circuits, 2nd edition, 1963
Trilingual edition **F, E, S.**

List of broadcasting stations operating in bands below 5950 kc/s, 2nd edition, 1963.
Preface in separate editions **F, E, S.**

International Radio Consultative Committee (CCIR) :

IXth Plenary Assembly, Los Angeles, 1959
Addendum No. 3 to the volumes I, II and III.
Spanish edition.

Xth Plenary Assembly, Geneva, 1963
Vol. I — Emission. Reception. Fixed Service. Vocabulary.
Vol. II — Propagation.
Vol. III — Mobile Service. Standard Frequencies and Time Signals. Monitoring.
Vol. IV — Radio Relay Systems. Space Systems. Radioastronomy.
Vol. V — Broadcasting. Television.
Vol. VI — Resolutions and Opinions of a general nature. List of Participants. Reports of the Director, the Finance Committee, etc.
Vol. VII — Minutes of the Plenary Sessions.

International Frequency Registration Board (IFRB) :

International Frequency List, 2nd edition, 1st February, 1963
Preface in separate editions **F, E, S.**
Vol. I — Particulars of frequency assignments between 10 and 4995 kc/s.
Vol. II — 4995-9995 kc/s.
Vol. III — 9995-28 000 kc/s.
Vol. IV — Frequencies above 28 Mc/s.

International Telegraph and Telephone Consultative Committee. (CCITT) :

Directives.
Editions in separate languages **F, E, S.**
IInd Plenary Assembly, New Delhi, 1960
Red Book.
Vols. VI and VII. **Spanish** edition.
Vol. V. Editions in separate languages **F, E, S.**

Conditions of sale

All documents ordered from the General Secretariat of the ITU (Place des Nations, Geneva, Switzerland) must be paid for in advance. Documents must be paid for in Swiss francs when they are ordered, unless a cash-on-delivery arrangement is requested.

Methods of payment:

a) Switzerland: postal cheque account - *Genève I. 50.*

b) Other countries: international postal order or bank transfer on the *Société de Banque Suisse*, Geneva.

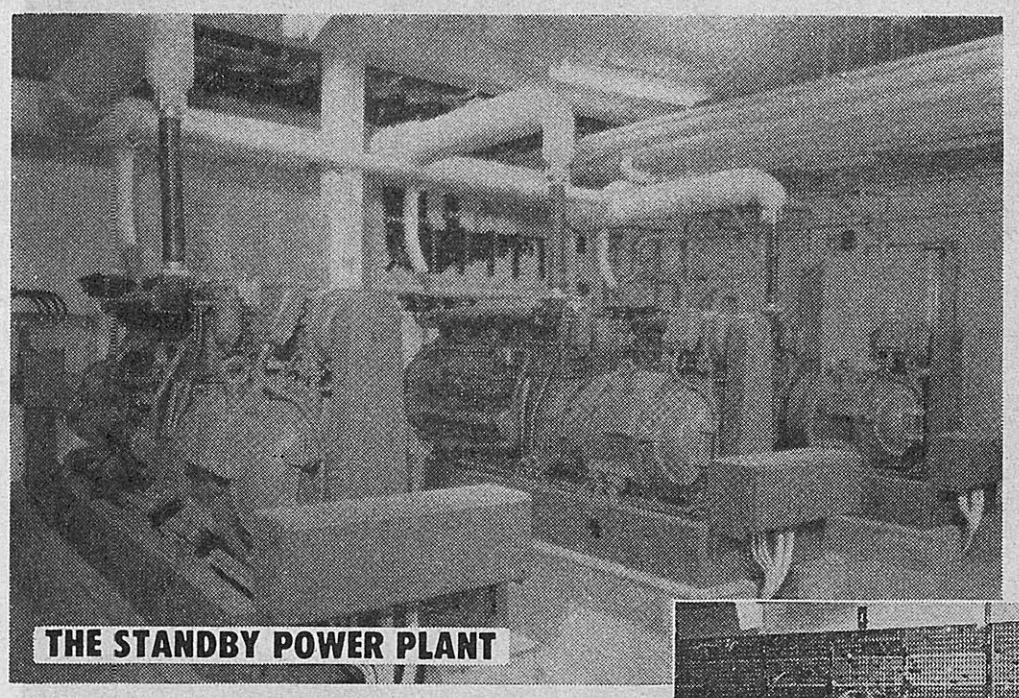
The prices quoted include packing costs and carriage by surface mail.
As the General Secretariat of the ITU sells its publications on a non-profit making and non-discount basis, no reduction can be made to booksellers.

THE BREAK

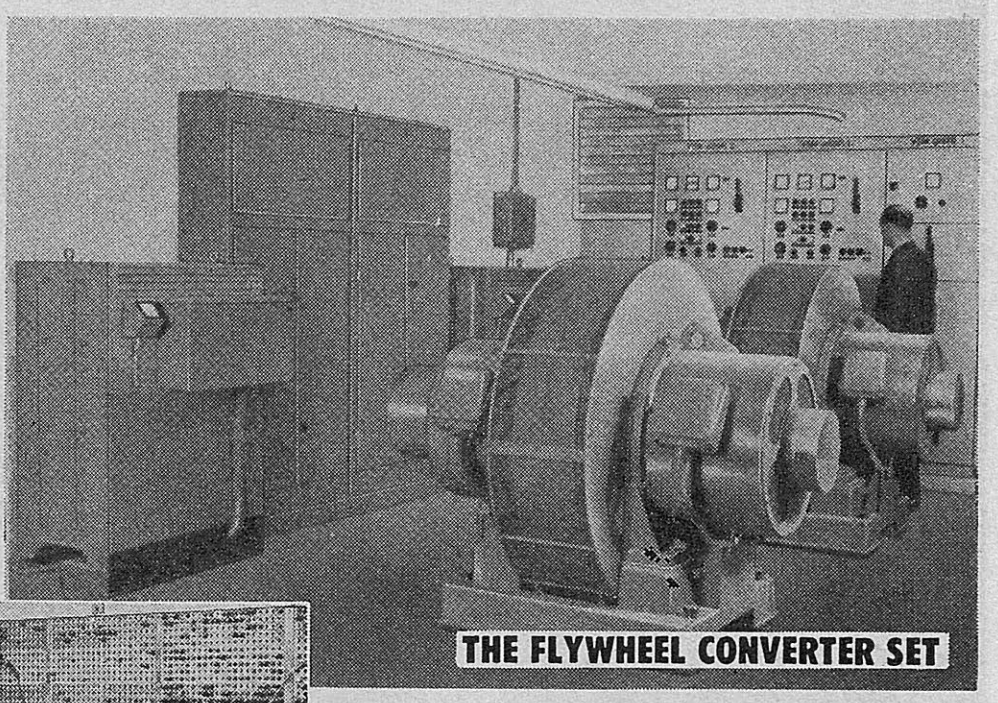
THAT WAS NO BREAK

In telecommunications you have to consider even a second's break to be too costly a loss of time. So a break should never be allowed to actually become a break.

Should YOUR problem be connected with too costly or too disturbing interruptions, in telecommunications or other fields, you may find a good solution by contacting ASEA...



THE STANDBY POWER PLANT



THE FLYWHEEL CONVERTER SET

The ASEA no-break equipment consists of two main parts, which can be set up at an arbitrary distance from each other. Of these two parts *the standby power plant* supplies emergency power within five seconds of a mains failure.

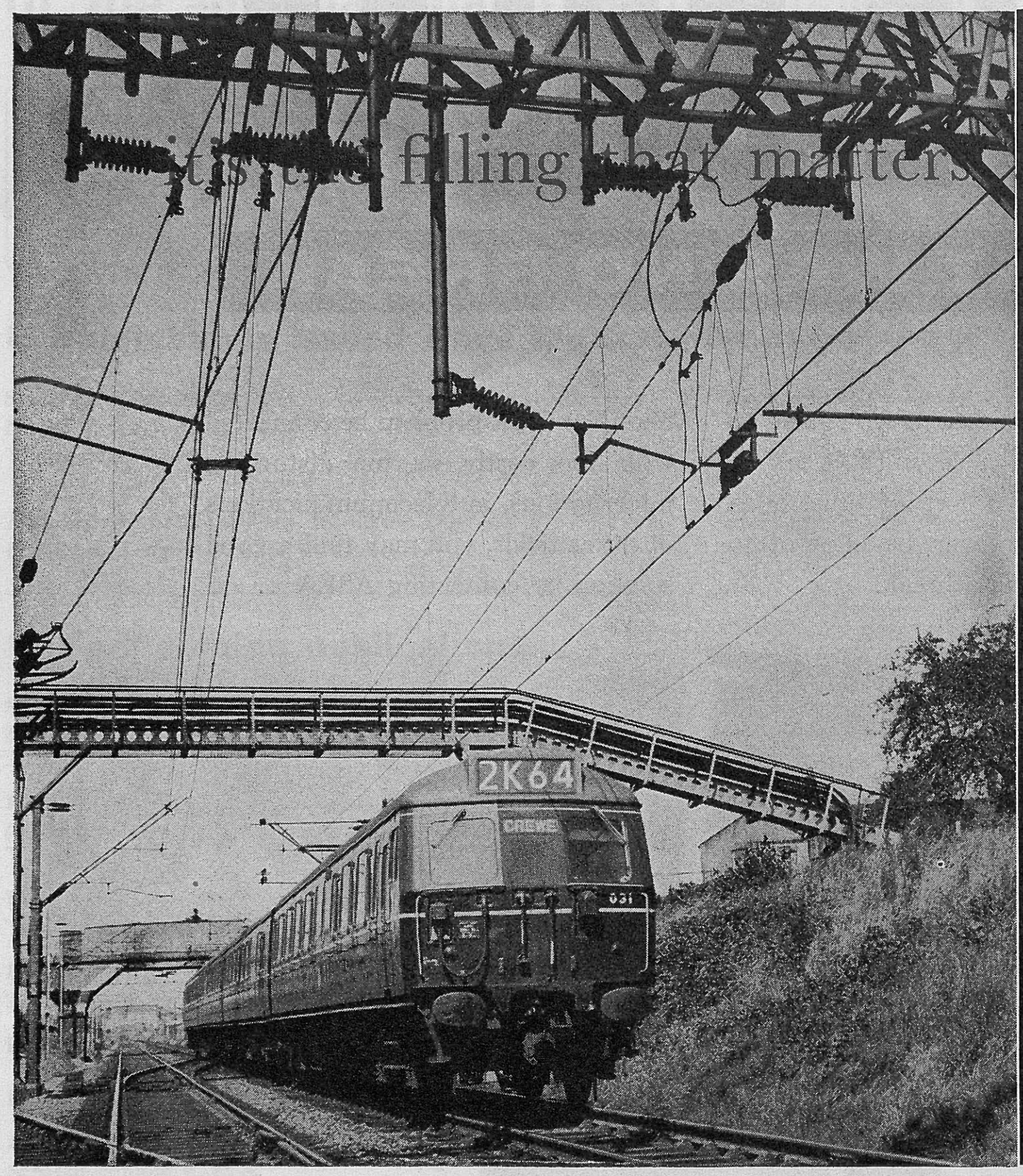
●

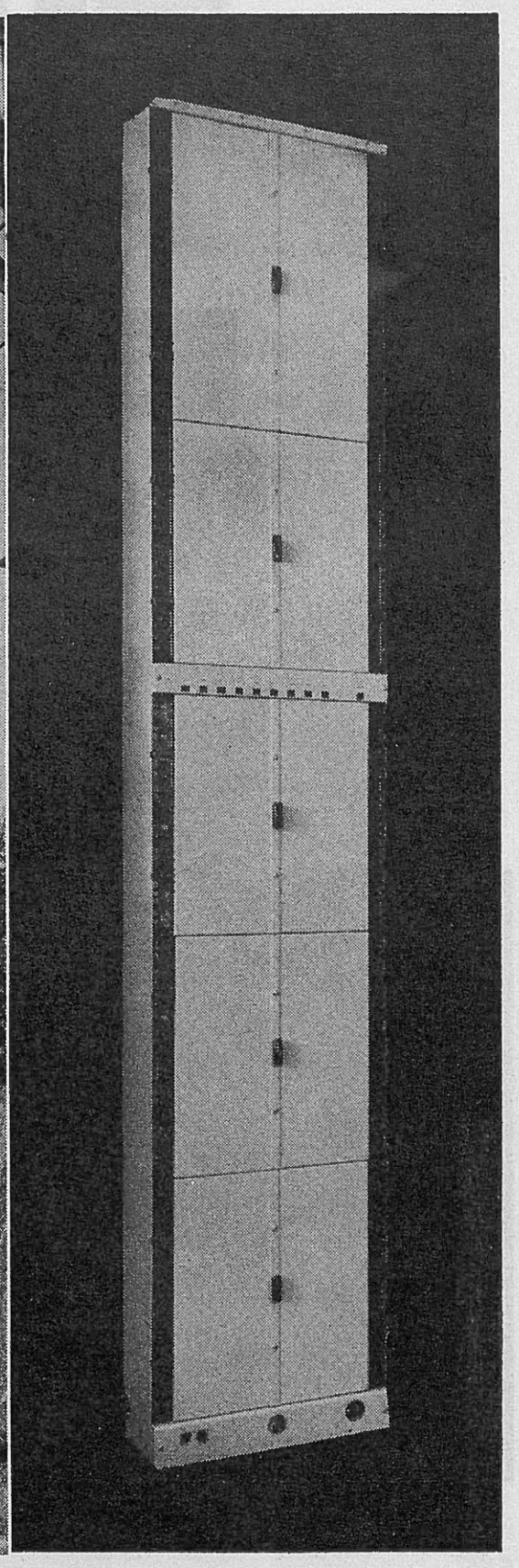
The flywheel converter set, shown in the right picture above, supplies power to all vital parts and this supply is unaffected by mains failures. Should the whole network be put out of gear, your communications will nevertheless continue! This flywheel converter set is designed to provide either A.C. for coaxial-cable systems, radio-link systems etc., or D.C. for local telephone exchanges — thus making batteries and charging equipment superfluous. And it can be used, too, with equal advantage in power plants to ensure an unbroken supply to the vital control systems.

ASEA

HEAD OFFICE · VÄSTERÅS · SWEDEN

it is the filing that matters

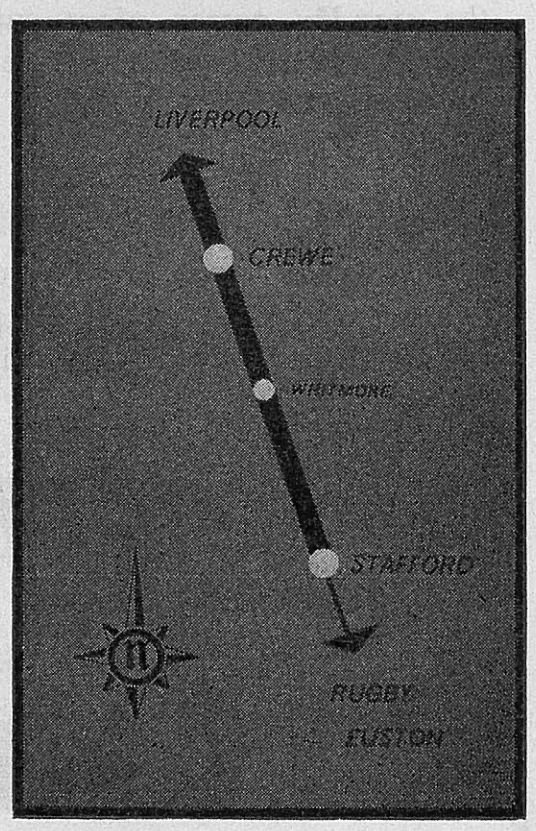




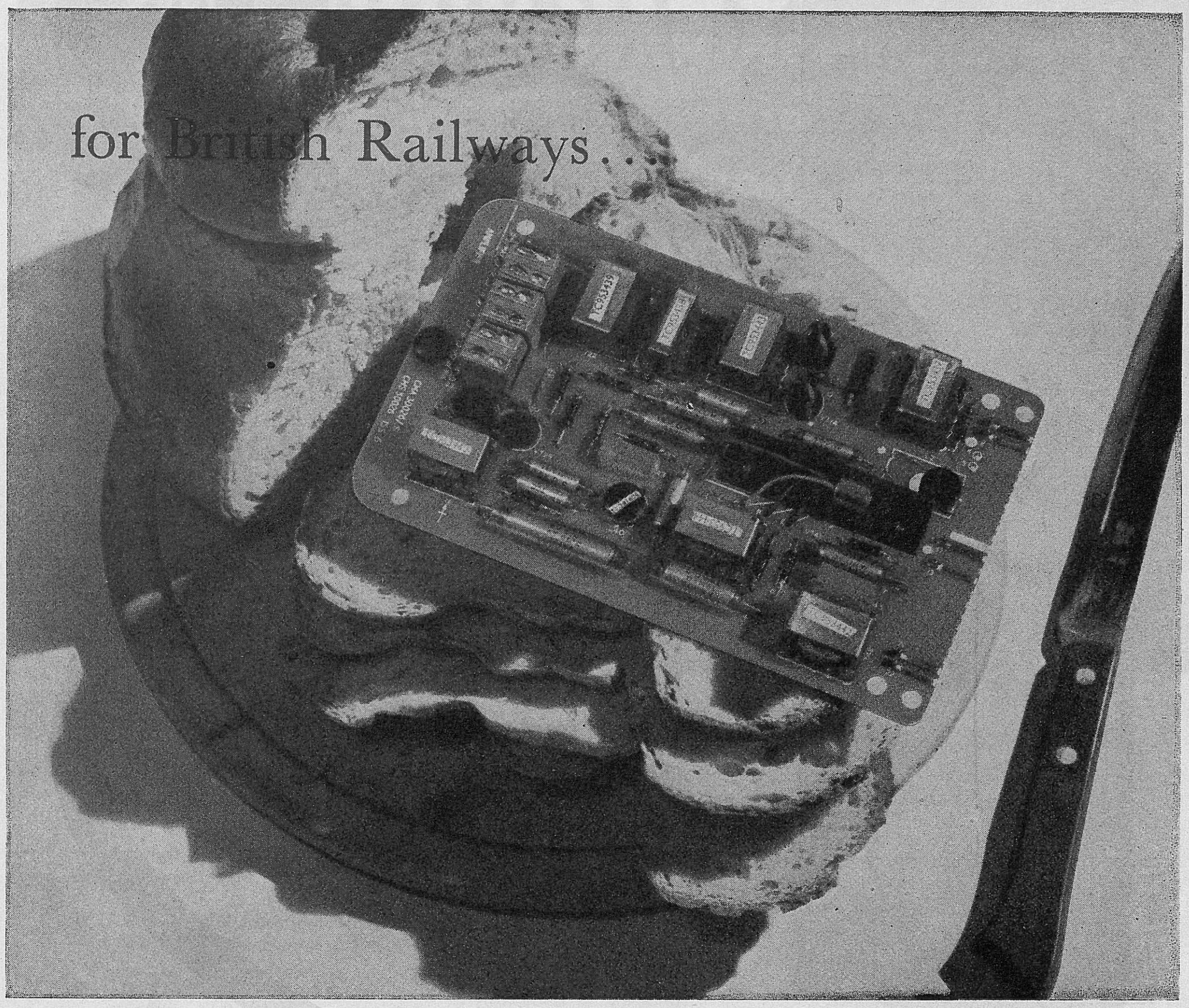
By courtesy of London Midland Region

A T & E Type CM carrier equipment has again been chosen by London Midland Region for their general electrification programme — Crewe/Stafford section.

The equipment, which will provide all the necessary channel modulating, frequency generating and out-band signalling, is designed for operation over a composite cable. Three groups of twelve channels, terminated at Crewe, operate over separate carrier pairs via repeaters at Whitmore. Two groups terminate at Stafford, whilst the third passes on via repeater at Stafford.



AUTOMATIC TELEPHONE & ELECTRIC COMPANY LIMITED



TYPE CM CARRIER

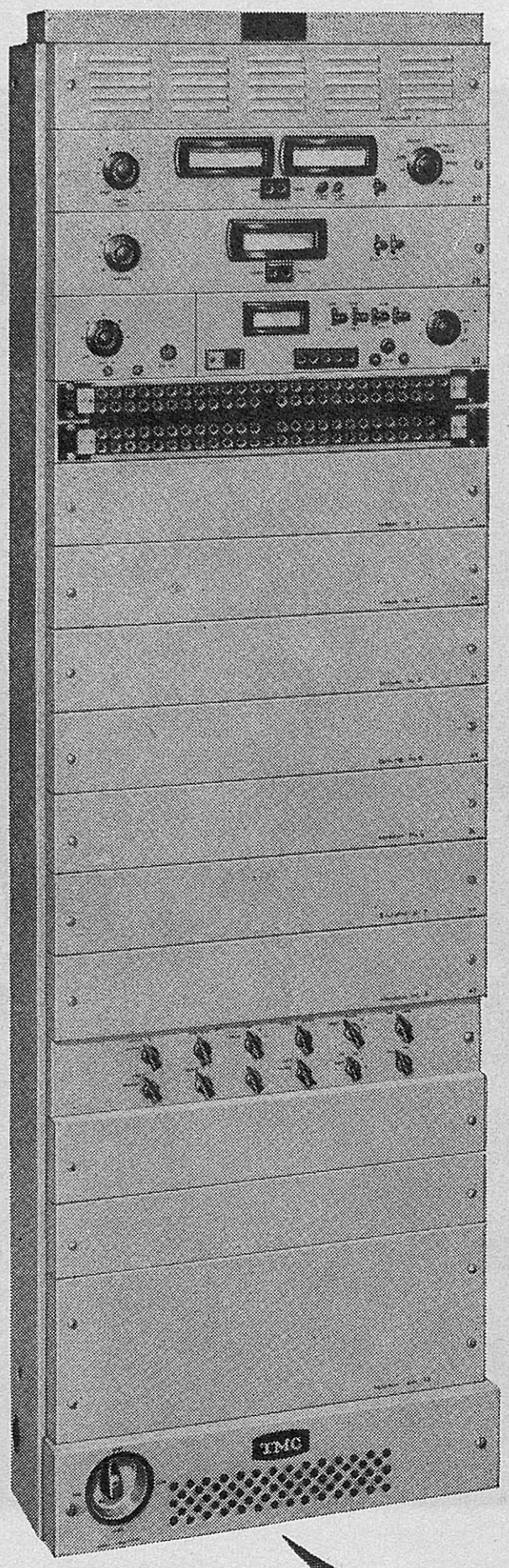
A T & E Type CM Carrier Equipment offers substantial saving in prime and operating costs whilst taking full advantage of the small size and proven reliability of modern components. Thus conventional methods have been discarded in favour of an advanced card mounting printed circuit technique. The result is a compact, reliable system with up to 90% power saving over equivalent valve equipment. A T & E Type CM Carrier Equipment has been chosen by British and overseas railways, and by other organisations, for microwave, open-wire and cable carrier communications.

*Fully transistorized *Plug-in printed circuit cards *Mains or battery operation *Optional in-built out-band 3825c/s low or high level signalling for ring down or dialling *Suitable for extension to existing valve equipment *Up to 96 channels per rackside *Easy accessibility *A third of the size of an equivalent valve equipment.

AUTOMATIC TELEPHONE & ELECTRIC COMPANY LIMITED
Strowger House · Arundel Street · London WC2. Telephone: Temple Bar 9262
Strowger Works · Liverpool 7

R5395

ATE(E)1



TMC

transistorized

120 baud VF telegraph terminal

Type T12A

Telegraph speed : 120 baud

Channel spacing : 240 c/s from 540 to 3180 c/s

Deviation frequency : ± 60 c/s

Telegraph d.c. input : 2.7 to 20 mA double current

Telegraph d.c. output : polarized relay

TMC type T12A equipment provides twelve 120-baud duplex channels on a 4-wire VF bearer circuit conforming with CCITT recommendations. Each channel is suitable for carrying a pair of teleprinters working on a time division multiplex basis. Plug-in units simplify maintenance and facilitate sub-equipping for unidirectional working.

We should like to explain in detail this or any other TMC equipment which will help to solve your telecommunications problems. Please write to:—

TMC

TELEPHONE MANUFACTURING COMPANY LIMITED

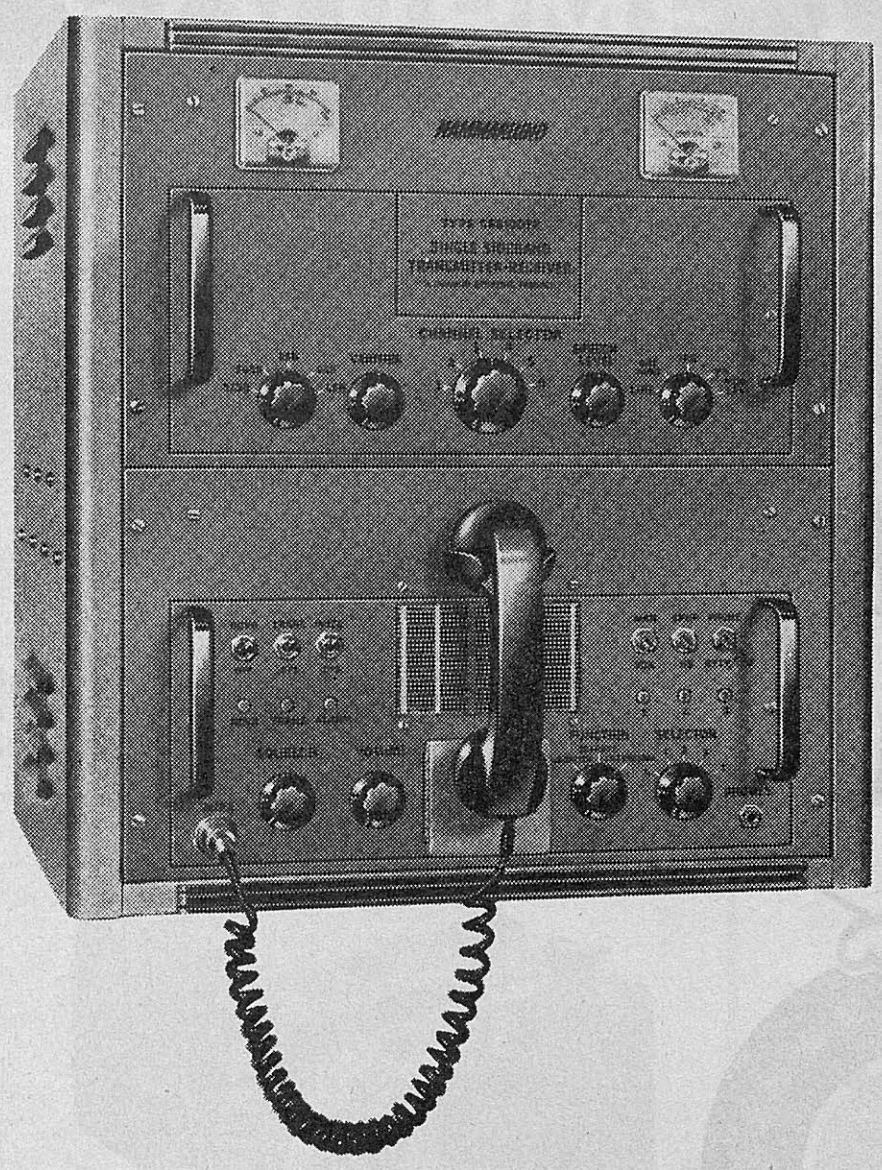
Transmission Division, Sevenoaks Way, St. Mary Cray, Orpington, Kent. Orpington 27020

A MEMBER OF THE PE GROUP OF COMPANIES

SELLING AGENTS:—

Australia & New Zealand: Telephone Manufacturing Co. (Australasia) Pty. Ltd., Sydney, New South Wales.
Canada & U.S.A : Telephone Manufacturing Co. Ltd., Toronto, Canada. *Also represented in other countries.*

HAMMARLUND
NEW TRANSMITTER-RECEIVER



100 WATTS
•
HIGH FREQUENCY
•
TOP EFFICIENCY
•
REAL ECONOMY

Utilizing the principle of single-sideband transmission for point-to-point networks, this model represents a new concept in medium and short-range communication between points where no land line facilities exist. Based on a system in use since 1926 for international radiotelephone communications, the new transmitter-receiver is superior to conventional AM in three important ways: less distortion, less interference, more privacy.

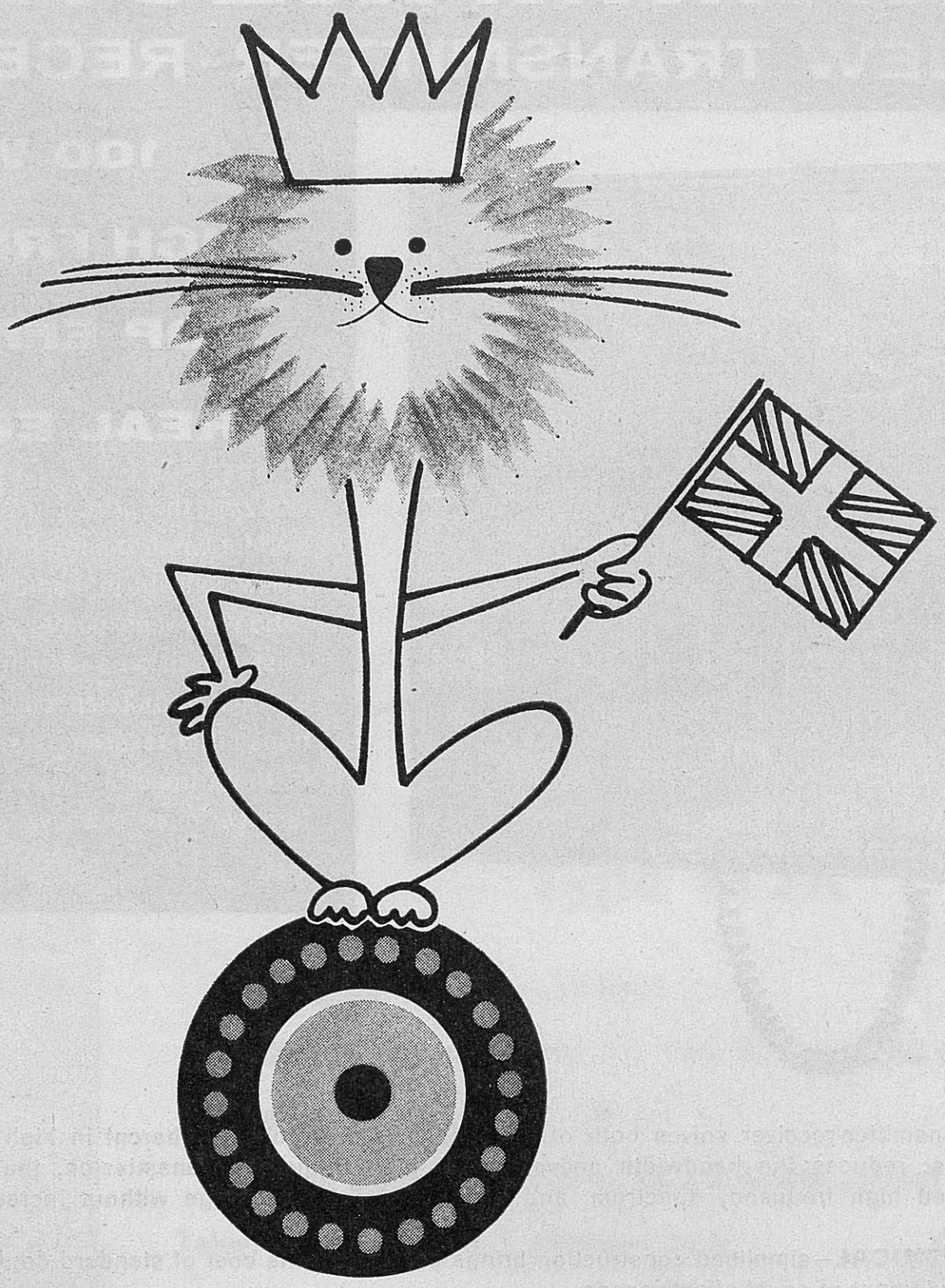
The new transmitter-receiver solves both of the fundamental problems inherent in high frequency transmission by AM methods: reduces the bandwidth necessary for high frequency transmission, thus relieving the increasingly more crowded high frequency spectrum, and provides greater coverage without increase in power consumption.

- **ECONOMICAL**—simplified construction brings cost below the cost of standard double-sideband AM equipment of equal effectiveness.
- **RELIABLE**—based on system in use since 1926 for international radiotelephone communications.
- **EFFICIENT**—in use of power as well as frequency space. Approximately eight times more efficient than conventional AM transmitters.
- **EFFECTIVE**—superior to conventional AM in three important ways: **less distortion, less interference, more privacy.**
- **VERSATILE**—can be used with teleprinter or hand key for telegraphy.
- **EASILY CONTROLLED**—all operating controls are on the front panel and reduced to a minimum; permit instantaneous selection of: one of six pretuned crystal-controlled channels; frequency range 2-30 Mc/s; phone or telegraphy; built-in-speaker; local handset or remote line for connection in another office; termination into telephone lines or teleprinter operation, etc. Designed for operation by non-technical personnel.

LOW COST AND ADAPTABILITY OF THE CSB100TR PERMIT EXPANSION OF EXISTING AM SYSTEMS AND FACILITATE SYSTEMATIC RETIREMENT OF ALL DOUBLE-SIDEBAND HF EQUIPMENT.

Write today for full details and catalog on this and other HAMMARLUND Communication Equipment Dept. TCJ

HAMMARLUND Manufacturing Company, Inc.
INTERNATIONAL DIVISION: 13 East 40th Street, New York 16, N. Y.
Cables: ARLAB



THE LION'S SHARE

Submarine Cables Ltd., England, and its predecessors have pioneered and supplied far the largest proportion of the world's submarine telecommunication cable—90% of the telegraph cable between 1850 and 1950 and the largest share of telephone cable since 1950—also the main cable-laying gear for Cable Ships, MONARCH, ALERT, MARCEL BAYARD, MERCURY, INGUL and JANA. For submarine telecommunication cable, repeaters and—through AEI—terminal equipment; for cable handling gear and also for deck auxiliaries, consult:

HERE ARE SOME OF THE COMPANY'S MILESTONES:

1850 *First ever submarine telegraph cable—from England to France.*

1866 *First successful transatlantic telegraph cable.*

1939 *First polythene-insulated submarine cable.*

1955/6 *First transatlantic telephone cable—95% supplied by the Company.*

1961 *First armourless telephone cable—2000 miles from Newfoundland to England.*

1961 *Longest repeatered 120-circuit telephone cable—400 miles from Newfoundland to Canada.*

1961/3 *Supply over 5000 miles of armourless cable and 90 repeaters for the 8000-mile Commonwealth Pacific system.*

1962 *Contract for 420-circuit transistorisea repeaters.*

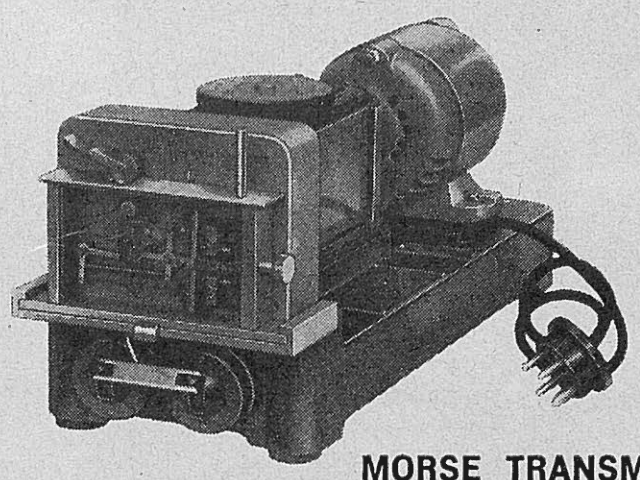
SUBMARINE CABLES LIMITED

(OWNED JOINTLY BY AEI AND BICC) · **MERCURY HOUSE · THEOBALD'S RD · LONDON WC1 · ENGLAND**

TELEGRAPH EQUIPMENT

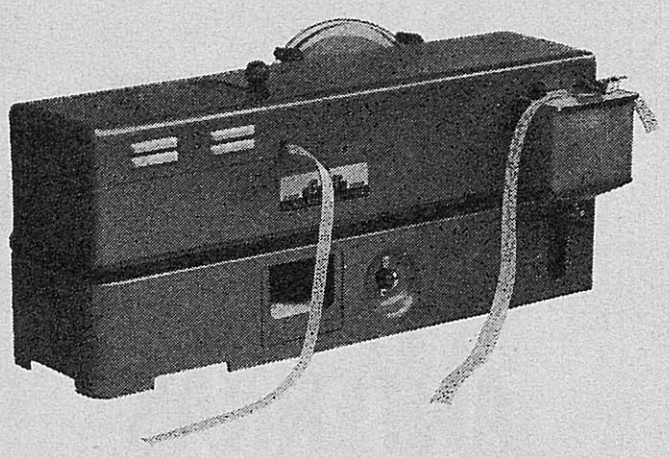
MORSE KEYBOARD PERFORATOR MODEL 50

Provided with locking device which prevents the simultaneous depression of two keys. Max. operating speed 750 characters per minute.



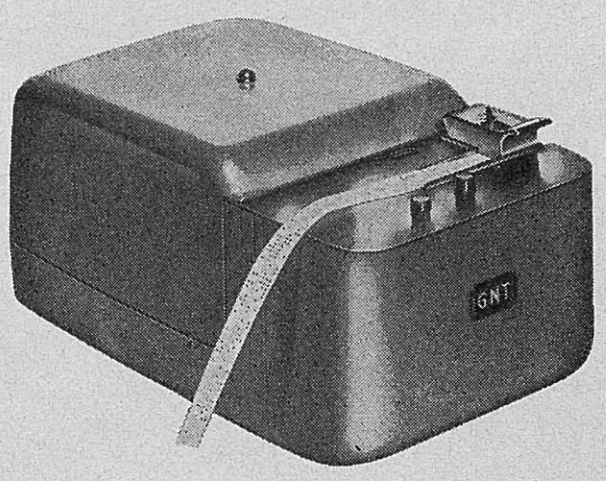
MORSE TRANSMITTER MODEL 112

Speed range 13–250 words per minute. For training schools model 115, having a speed range of 5–35 words per minute and permitting insertion of extended pauses between letters and words, is recommended.



CONVERTER MODEL 2206

For the conversion of a perforated 5-unit Code tape into a perforated Morse Code, or Cable Code, tape.

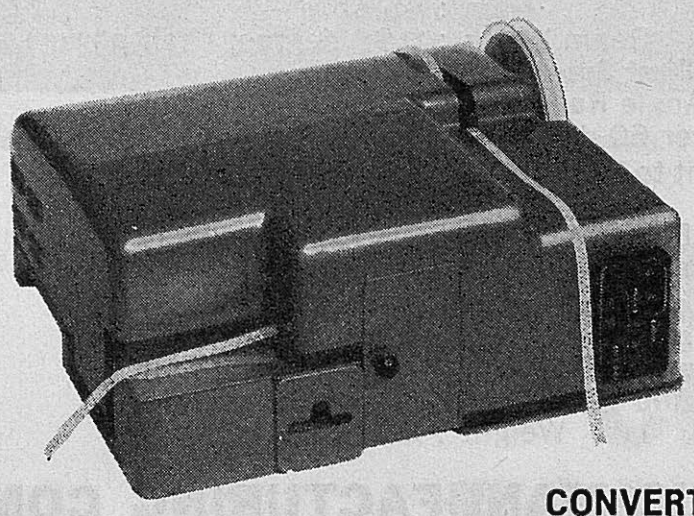


5-UNIT TRANSMITTER MODEL 20

For telegraphy on the start/stop principle. Pressurised chamber of the transmitter head reduces maintenance to a minimum.

MORSEINKER MODEL 1532

For training purposes. Operated by tone frequency signals which are amplified and rectified in a built-in transistor amplifier/rectifier.



CONVERTER MODEL 2201

For the conversion of a perforated Morse Code, or Cable Code tape into a perforated 5-unit Code tape or into 5-unit signals at standard teleprinter speed.

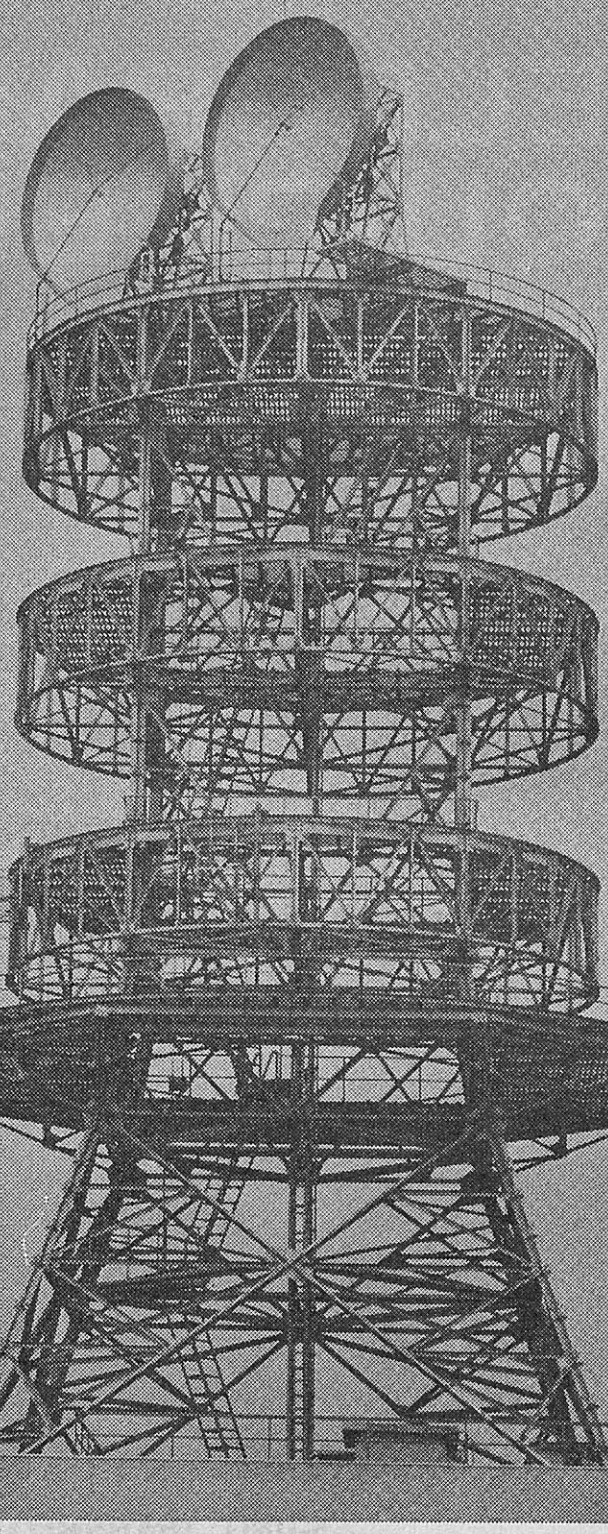
G.N.T.

GREAT NORTHERN TELEGRAPH WORKS

DIVISION OF THE GREAT NORTHERN TELEGRAPH CO. LTD.

4, SYDHAVNS PLADS
COPENHAGEN SV, DENMARK

LONDON OFFICE: 5 ST. HELEN'S PLACE
LONDON, E. C. 3



MITSUBISHI MICROWAVE ANTENNAS FOR TELECOMMUNICATIONS

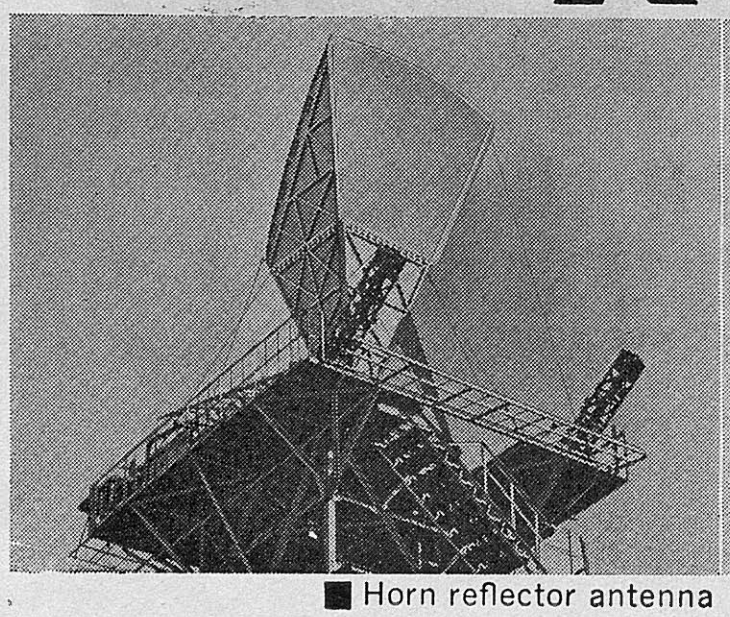
Japan today has the second largest microwave network in the world. Mitsubishi Electric, with the longest microwave antenna experience in Japan, has supplied 90% of the antennas used in the trunk lines of this extensive network. Mitsubishi antenna systems include parabolic, scatter, horn reflector and radar types, as well as a complete line of waveguide components and accessories. Frequencies from 900 Mc. to 24 KMc. are covered. The IU-61, shown above and specified at the right, is typical of the outstanding performance of Mitsubishi microwave antennas. Full technical information on any of these types of antennas is available at your request.

IU-61 6000 Mc. Band Parabolic Antenna

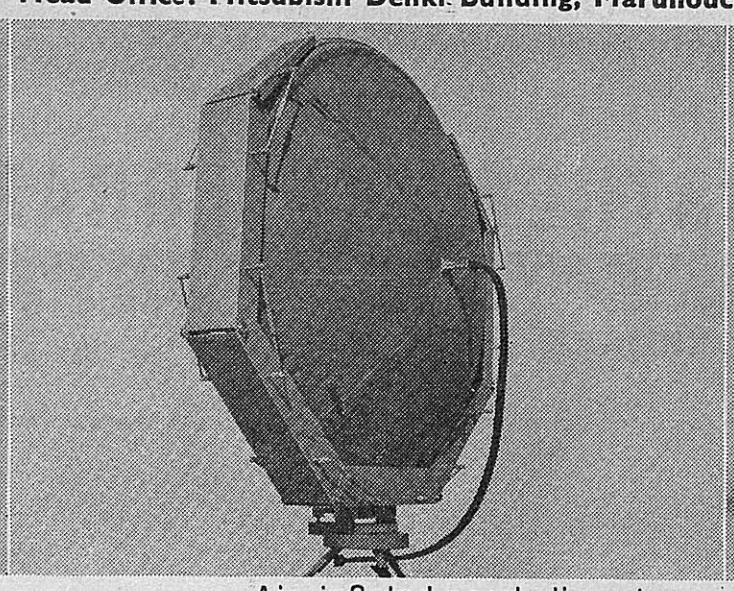
Diameter	: 4 meters
Frequency Range	: 5925~6175 Mc/s or 6175~6425M c/s
Feed System	: Dual circularly polarized wave
Gain	: 45 db
Beam Width	: 0.98 degrees (half power)
First Side Lobe	: −23 db
Wide Angle Radiation (over 60 degrees)	: −60 db
Front-to-Back Ratio	: 65~70 db
VSWR	: 1.02
Ellipticity Ratio	: 1.1 (power axial ratio)
Discrimination of anti-circularly polarized wave	: −30 db
Coupling of Both Arms	: −35 db
Guaranteed for Wind Velocity of	: 60 meters/second
Weight	: 800 kilograms

MITSUBISHI ELECTRIC MANUFACTURING COMPANY

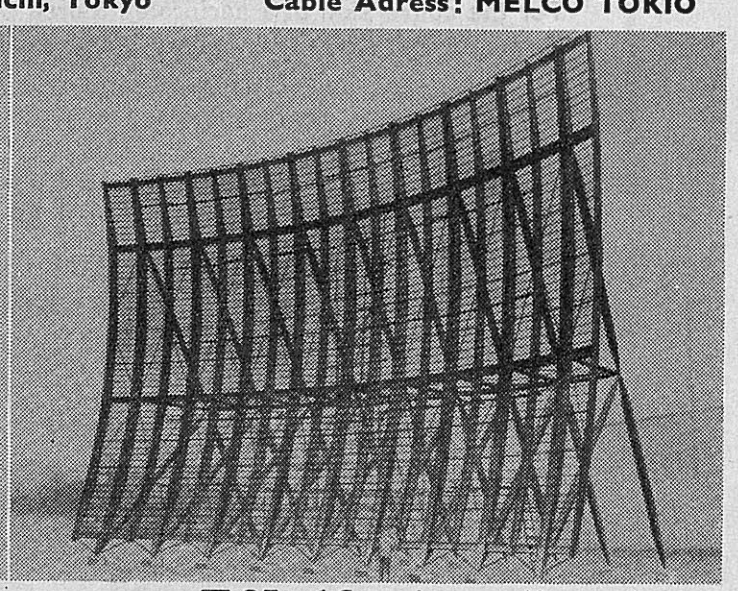
Head Office: Mitsubishi Denki Building, Marunouchi, Tokyo Cable Adress: MELCO TOKIO



■ Horn reflector antenna



Air inflated parabolic antenna

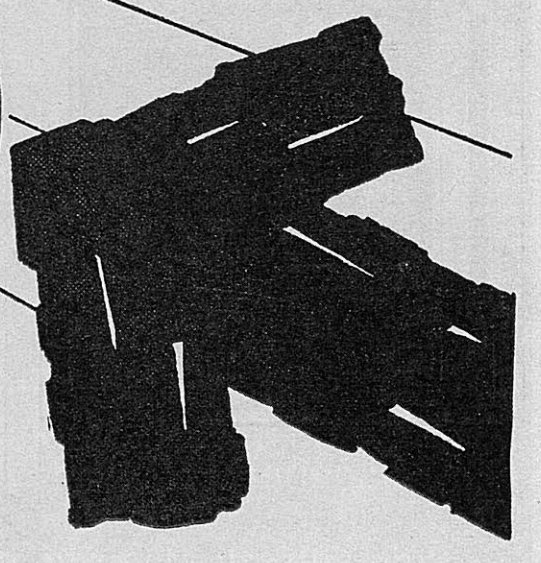


■ 25×16 meter scatter antenna

Type 56 transistored channel equipment at Faraday Building.

ALL ALONG THE LINE

G.E.C.



TYPE 56 CHANNEL EQUIPMENT

G.E.C. transistored channel equipment in Type 56 construction is available in two forms, one for use with separate signalling equipment and the other with built-in out-of-band signalling. The G.P.O. alone has ordered **26,700** channel ends for use with separate in-band signalling equipment, and of this quantity more than **11,800** channel ends are already installed. A nine foot high rackside accommodates 72 channel ends without signalling or 60 channel ends with signalling. *For further information please write for leaflet, SPO. 3006.*

Transmission Division

G.E.C. (TELECOMMUNICATIONS) LIMITED

TELEPHONE WORKS · COVENTRY · ENGLAND · Works at Coventry and Middlesbrough

About 20 % of the addresses contained in our publications INTERNATIONAL TELEX SERVICE and WORLD TRADE TELEX have to be revised yearly. The careful compilation of those officially registered modifications, deletions and additions ensure that you receive up-to-date International Telex Directories.

Please request our offer.

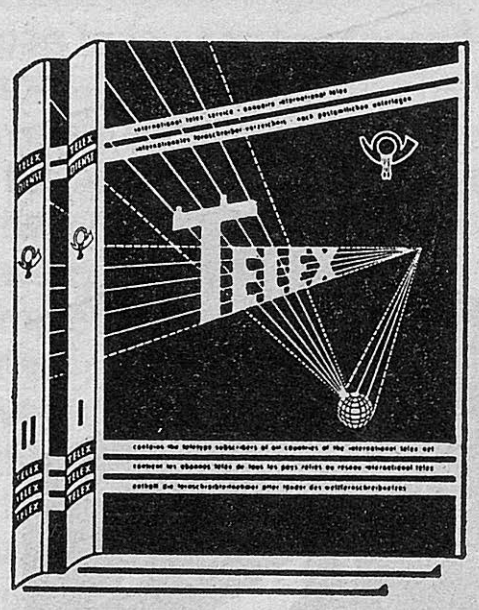
A peu près 20 % des adresses contenues dans nos ouvrages ANNUAIRE INTERNATIONAL TELEX et WORLD TRADE TELEX doivent être rectifiées chaque année. Ces modifications, additions et suppressions signalées d'office sont élaborées soigneusement, vous assurant ainsi la réception de l'ANNUAIRE INTERNATIONAL TELEX le plus actuel.

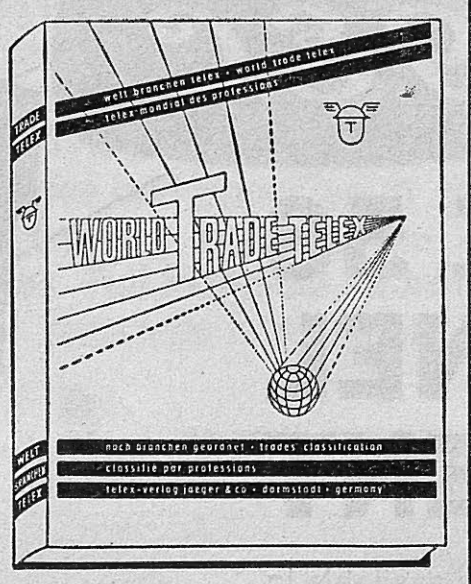
Veuillez demander notre offre.

Etwa 20 % des Adressenbestandes in unseren Werken INTERNATIONALES TELEX-VERZEICHNIS und WORLD TRADE TELEX müssen jährlich berichtigt werden. Diese amtlich gemeldeten Änderungen, Neuanschlüsse und Streichungen werden sorgfältig bearbeitet und sichern Ihnen aktuelle internationale Telex-Verzeichnisse.

Bitte fordern Sie unser Angebot an.

INTERNATIONAL TELEX SERVICE
ANNUAIRE INTERNATIONAL TELEX
INTERNATIONALES TELX-VERZEICHNIS





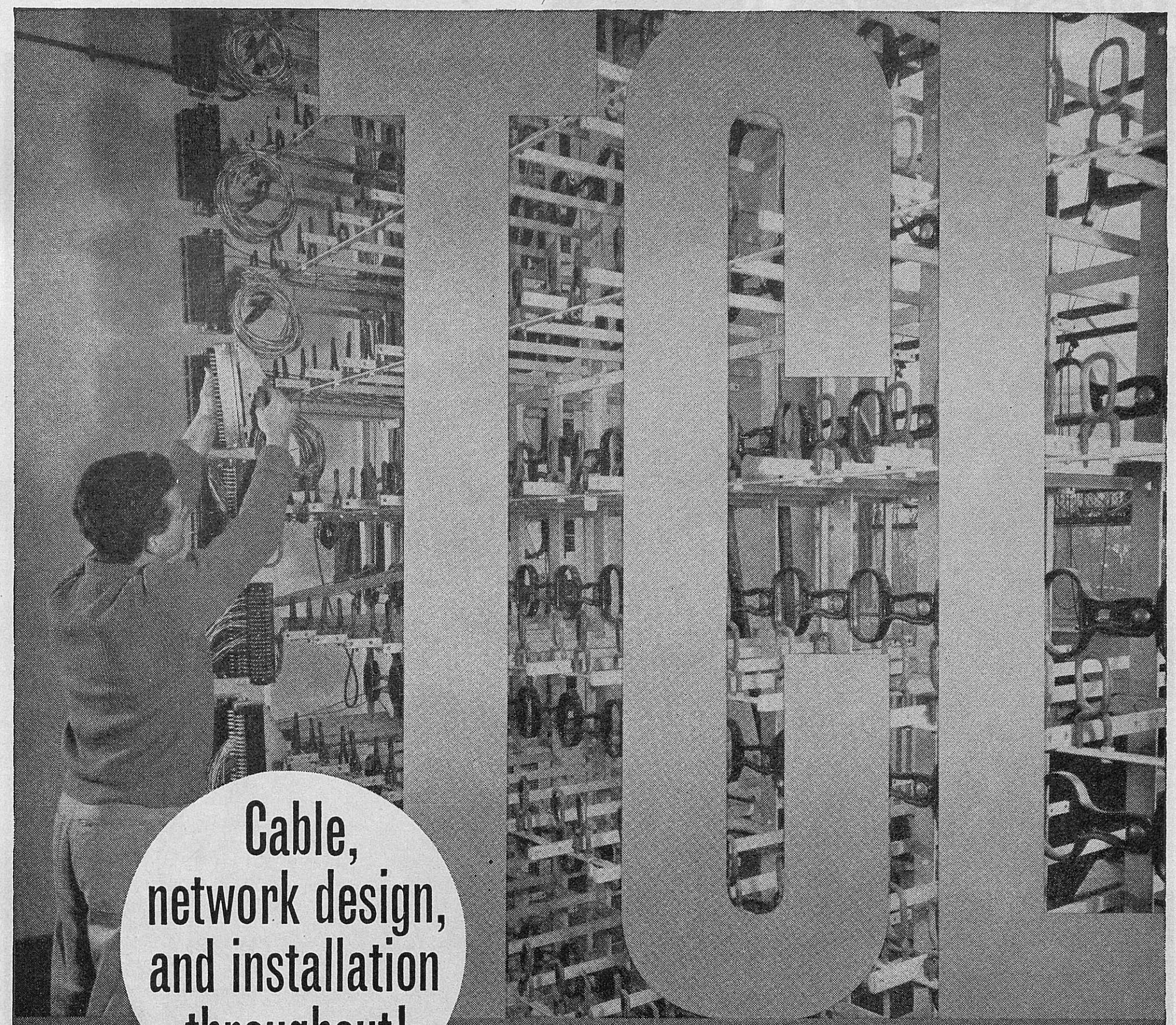
WORLD TRADE TELEX
TELEX MONDIAL DES PROFESSIONS
WELT BRANCHEN TELEX

TELEX-VERLAG JAEGER & WALDMANN:
61 DARMSTADT, GERMANY: HOLZHOFALLEE 38
TELEX 4 189253

Advertise in the Telecommunication Journal!

The *Telecommunication Journal* is the official organ of the International Telecommunication Union, the United Nations specialized agency for telecommunications. It appears once a month in separate English, French and Spanish editions. It is read by the senior officials and directors of all major organizations, both governmental and private, which operate telecommunication services, and it is a unique medium of publicity for the manufacturers of equipment used in the management and operation of such services.

For further information on advertising in the Telecommunication Journal, contact Annonces-Service Post S.A., Wydäckerring 140, Zurich 9/47.



Cable, network design, and installation throughout!

TELEPHONE CABLES LIMITED

not only manufacture telephone cables in an immense variety of types, sizes and different kinds of insulation, but also undertake the installation of complete systems and will supply highly experienced technicians to supervise the work throughout. Entrusting the whole project—its design, production and installation—to T.C.L. ensures the greatest speed, efficiency and economy . . . and above all—long term reliability in operation.

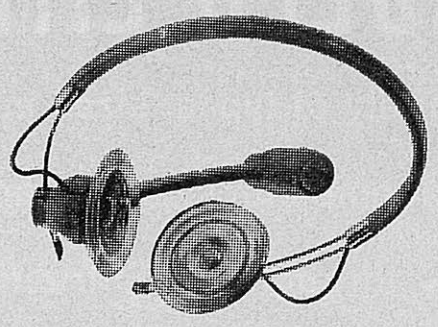
TELEPHONE CABLES LIMITED, DAGENHAM, ENGLAND · TELEPHONE: DOMINION 6611 · CABLES: DRYCORE DAGENHAM

THE ORGANISATION WITH 125 YEARS' EXPERIENCE

All-dynamic headphone-microphone combination

The best in headphones combined with the best in microphones: crystal clear sound reproduction plus anti-noise true-fidelity pick up.

The K 58 is a combination of the world-famous K 50 headphones with the brand new D 58 dynamic anti-noise microphone. The headphones reproduce the wave form of the original with an unusually high fidelity. The method of transferring electrical energy to acoustic energy is basically dynamic, but unlike all other transmitters, the K 58 is a first order system. No tight coupling to the ear is necessary, nor bulky resonators or hot air-tight enclosures.



K58

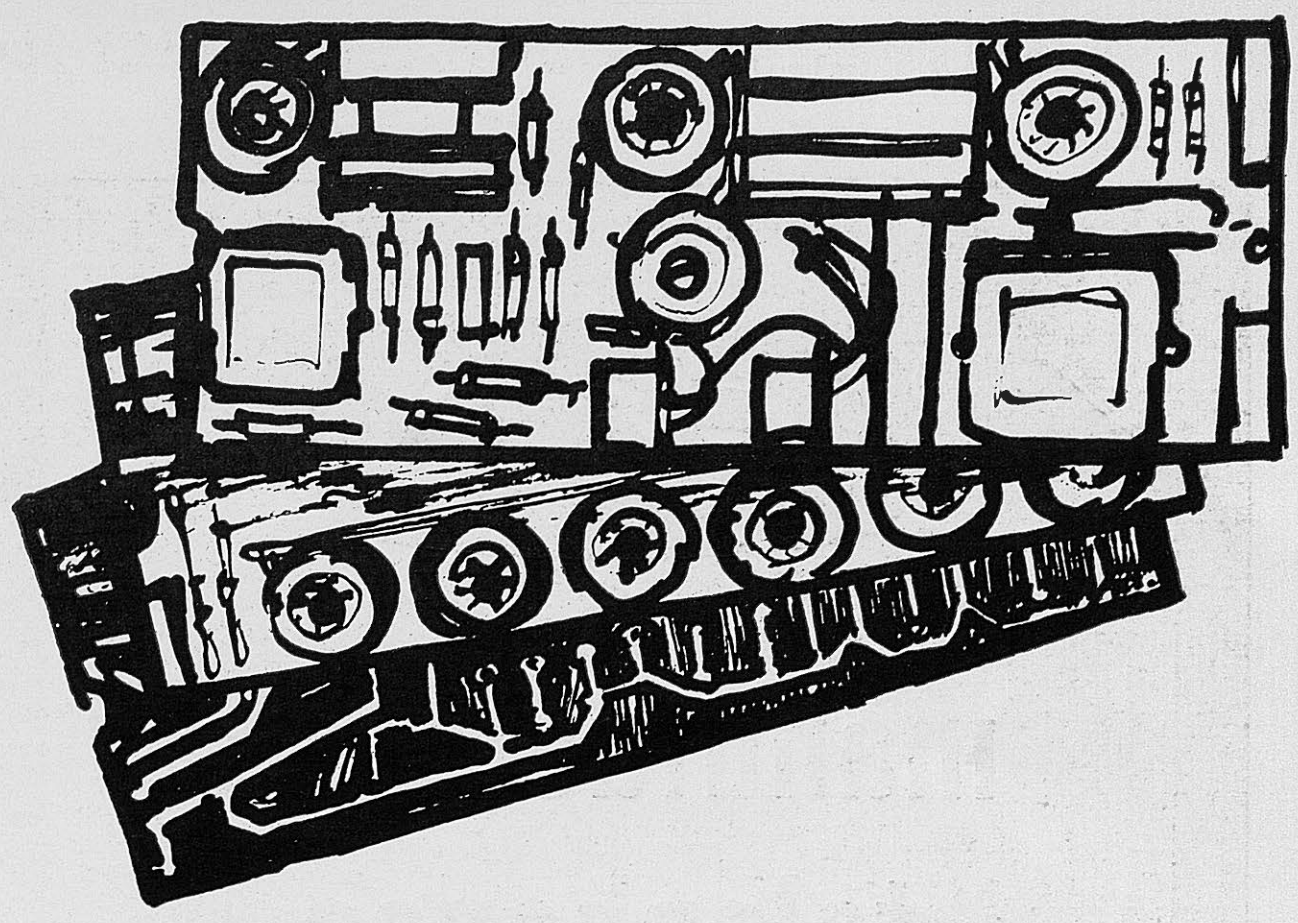
The microphone of the K 58 utilizes a differential principle. Only sound, originated very close to the microphone, is picked up. A special diaphragm permits use of this dynamic microphone even in iron dust atmosphere.

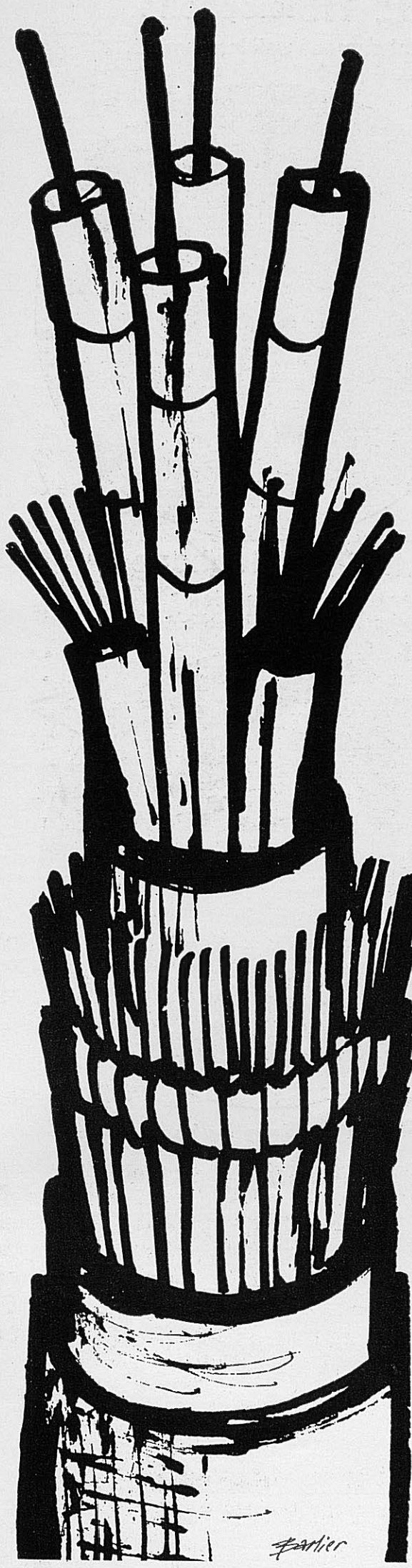
Hands remain free for other activities, there is no fatigue, even after long hours of use.

Best choice for: Audio visual teaching, Intercommunication systems, Broadcast and TV reporters, Dispatching systems, Supervision and control centres for industry, traffic, and communication operations, Systems where the microphone is used near loudspeakers. Best intelligibility under most severe conditions: if this is the aim the K 58 is your choice.

AKG

For details of other AKG products, see your Dealer or write to Akustische u. Kino-Geräte Gesellschaft m.b.H., Vienna 15., Nobilegasse 50. Cable address: MICROPHONE WIEN, Telex No. 01 1839.





TÉLÉCOMMUNICATIONS

Ayant participé depuis le début du siècle au développement du réseau téléphonique français à grande distance, la S.A.C.M. poursuit sa collaboration avec l'Administration Française des Postes et Télécommunications.
S.A.C.M. étudie et construit :

- des câbles de télécommunication à grande distance avec leurs équipements de téléphonie multiplex à courant porteur et leurs répéteurs.

S.A.C.M. poursuit ses études dans le domaine des techniques impulsionnelles et construit notamment :

- un équipement de transmission à grande distance, sur circuit téléphonique normal, de données numériques binaires à la cadence de 1.500 impulsions-chiffres par seconde.

- un équipement téléphonique multiplex à modulation en delta, se prêtant particulièrement bien à l'adaptation de dispositifs de secret.

La S.A.C.M. fournit et installe enfin l'essentiel des équipements basse-fréquence de radiodiffusion :

- prise de son ; distribution des modulations ; magnétophones fixes.

SOCIÉTÉ ALSACIENNE DE CONSTRUCTIONS MÉCANIQUES

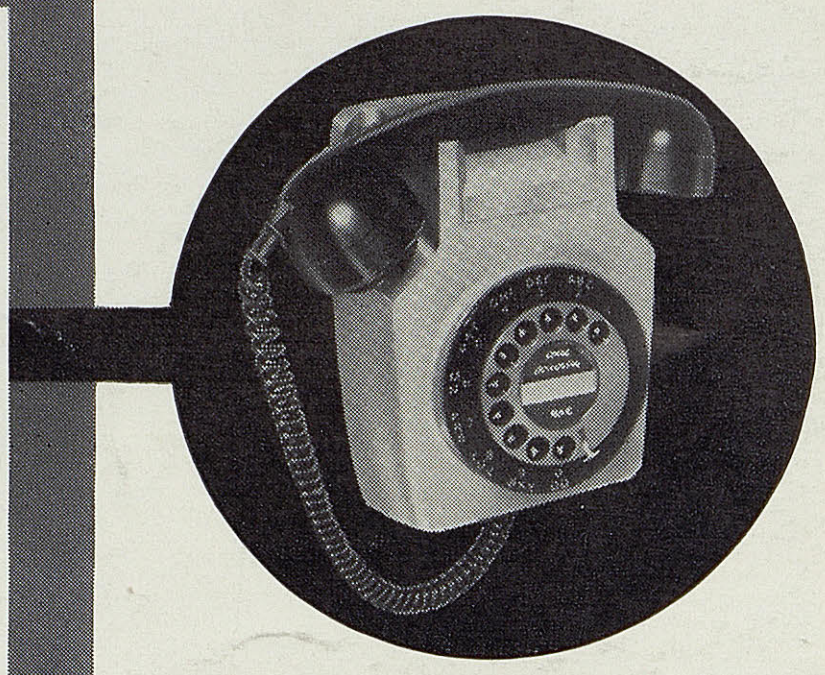
énergie nucléaire
télécommunications
électronique

69 RUE DE MONCEAU PARIS 8e

impact

G.E.C.

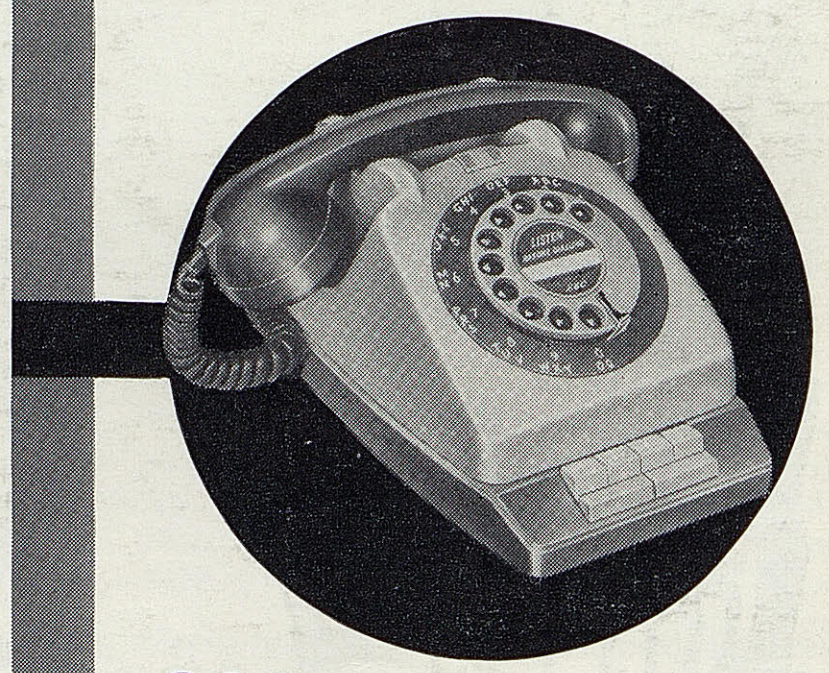
manufactures telephones for all applications



G.E.C. 711 telephone
a general purpose wall instrument.

G.E.C. 710 telephone
for plan and extension systems and special facilities.

G.E.C. 706 telephone
a general purpose table instrument.



G.E.C. switching telephone
for plan 105 and plan 107 operation.

G.E.C. also produces intercommunication sets, loudspeaking telephones and telephones for special applications for ships, railways, mines etc.

Telephone Division

G.E.C. (TELECOMMUNICATIONS) LTD · TELEPHONE WORKS · COVENTRY · ENGLAND

Works at Coventry and Middlesbrough